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THE COOLING AND STORAGE OF TABLE POULTRY*

R. S. HANNAN, H. J. SHEPHERD and D. H. SHRIMPTON

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Poultry is distributed in three forms, fresh (or unfrozen), frozen and canned. The first of these constitutes by far the greatest proportion of the trade at present but receives little scientific consideration.

The demand for fresh poultry in the countryside can readily be met; indeed, the supply of high quality birds is traditional in rural areas. The village or small town butcher, knowing both suppliers and customers individually, can usually so arrange the slaughter of poultry that each customer is promptly supplied with a carcase suited to his particular preferences. To supply large urban populations with fresh poultry, however, is an entirely different problem. In the larger stores, where the trade is greatest, the manager seldom knows personally either his suppliers or his customers. Day to day demand cannot be known but only predicted and storage of carcases for at least a few days after slaughter and during distribution is a necessary part of this trade.

At present the majority of poultry packers in this country are meeting the demand for poultry meat by extending traditional procedures rather than by adopting American methods or by developing new ones. Thus, interest in the United Kingdom is mainly in the keeping qualities of the uneviscerated carcase whereas in the United States it is in newer methods of preserving the eviscerated carcase.

Our research during the last three years has therefore been mainly concerned with a review of the basic features of British practice and the practicability of newer methods, including the use of antibiotics and ionising radiations, to extend the storage life of uneviscerated carcases, and also of eviscerated ones.

Methods of cooling

It is well established that uneviscerated carcases should be cooled promptly after slaughter and our first studies were directed towards a comparison of the efficiency of the various methods which are in current use in the United Kingdom. Methods of killing, bleeding and plucking are fairly

* Paper given at a conference of the United Kingdom Branch of the World's Poultry Science Association, held in London, England, December 6, 1956.

standard and compare with those used in the U.S.A. except that dislocation of the neck is used more frequently in this country. Methods of cooling, however, differ widely from American practice and, in particular, wet methods are seldom used. Two basic methods are in common use:—

1) Dry cooling in air or an air blast. The air may or may not be artificially cooled.

2) Contact cooling; i.e. part of the surface of the bird is pressed into contact with a cold metal surface.

We do not propose to discuss the mechanical details of the various methods of achieving cooling. The main object, removing body heat from freshly killed birds, can be attained in many ways; but the final choice of method depends very largely on local circumstances. We have found that the efficiency of cooling can be summarised without reference to a particular method and we have obtained figures to compare typical methods of dry cooling both with one another and with the wet methods, using ice and water, which are usually used in North America.

An arbitrary index of cooling rate was needed to correlate the extensive data obtained and we have found it convenient to use the time required to cool the carcase by three-quarters of the difference between the initial and final temperatures. Thus, in the case of a bird cooling from 100°F to 40°F this represents the time required to reach 55°F in the deepest part of the carcase. This three-quarter cooling time is a convenient index since it represents a substantial degree of cooling and, when doubled, gives approximately the fifteen-sixteenths cooling time; i.e. virtually the time required for the centre of the bird to reach the temperature of the cooling medium. As shown in Table 1, the operative factors are the weight of the carcase and the rate of agitating the cooling medium.

TABLE I

Effect of method of cooling and weight of carcase on cooling time

Method of cooling	Three quarter cooling time 3-lb. carcase	6-lb. carcase
Cold[1] air, circulated slowly	3 hr. 5 min.	5 hr. 0 min.
Cold[1] air at 50 ft/min.	2 hr. 20 min.	4 hr. 10 min.
Cold[1] air at 550 ft/min.	1 hr. 20 min.	2 hr. 50 min.
Ice and water	1 hr. 10 min.	2 hr. 10 min.

[1] Temperatures used experimentally were usually approximately 36°F., but three-quarter cooling times were similar even with air at 70°F.

Individual features of plant design have a modifying influence on these basic performance figures. In one particular packing station we found that leaving wide spacing on the cooling racks gave a three-quarter cooling time of about 3½ hours whereas dense packing increased this to 5½ hours. In other cases we found that trussing the carcases, resulted in a delay in cooling, but this was smaller than generally believed.

The position with contact cooling is less easily summarized. There is no doubt that pressing a carcase into contact with a cold surface (e.g. a plate or pipe several degrees below freezing point) produces rapid cooling of the flesh near to the points of contact. This is not, however, the same thing as cooling the entire carcase. There is, we feel, sufficient evidence to show that cooling the mass of the intestine is the desired aim and when this is adopted as the criterion of cooling the contact plate methods in common use prove to have about the same efficiency as cooling in slowly-moving, cold air. A characteristic of some of these methods is that the positioning of the carcase for cooling is critical and can give variable results depending upon the skill of the operator.

The weight changes during cooling can be expected to vary from an appreciable loss of weight in a blast of dry air to an appreciable gain ("plumping") in ice and water. Table 2 summarizes observations on the effect of various methods of cooling on the weight of the carcase.

TABLE 2

Effect of methods of cooling on the weight of the carcase.

Method of cooling	Relative humidity %	Time of cooling hr.	% change in weight	
			Average	Range
Intermittent slow air circulation	73	3½	—0.17	0 to —0.7
Air blast 550 ft/min.	70	5	—0.3	0 to —1.0
Ice and water (wet plucked)			+2.8	0 to +6
Ice and water (dry plucked)			+3.5	+3 to +5

For rapid cooling, the use of a blast of air travelling at 200 ft/min. or more or immersion in a mixture of ice and water are both good, the major difference between them being that a bird cooled in air loses weight whilst one cooled in water gains weight. But both methods are more elaborate and costly than those in current use in most parts of the country.

The results of our work on cooling have been published by H. M. Stationery Office as Food Investigation Technical Paper No. 4.

Methods of storage

Because of the notoriously poor keeping qualities of eviscerated carcases when no refrigeration is available, it is customary in Britain to delay evisceration as long as possible and to store fresh (unfrozen) birds uneviscerated. Under these conditions, the first signs of spoilage are usually those of greening. These green discolourations, more prominent on broilers and lean birds than on hens, are first visible on the vent, abdomen or tail of the carcase. In extreme cases, however, greening can occur on any part. The speed with which these discolourations can occur depends upon many factors; for example, the period for which the bird was starved before slaughter, the rapidity of cooling of the carcase, and the temperature at which the carcase has been stored. In our experience, greening is unlikely to occur at temperatures of storage less than 41°F. With increasing temperatures of storage, however, the rate of greening increases rapidly so that spoilage occurs in less than 24 hrs. at summer temperatures of 70°F and higher.

Although it is traditional to starve poultry before slaughter, there is no published information on the manner in which birds should be fed in order to give a carcase with optimal storage qualities. We are at present studying this problem since we have confirmed the opinion of earlier American workers that greening, an indicator of spoilage, is the result of the activities of the microflora of the gut, where hydrogen sulphide is produced and, after diffusing through the body to the skin, reacts with blood pigment and air to give a green pigment. The aim of our experiments is therefore to modify the gut flora so that hydrogen sulphide is produced more slowly even in the absence of refrigeration. We have at present no knowledge of the influence of the widespread medication of poultry feeds on this problem.

Recently the use of antibiotics as food preservatives has been suggested and in the United States and some other countries, they are already used in the poultry trade for this purpose. However, the processes are all based upon wet methods of cooling with slush ice after the carcases have been eviscerated.

At the time our survey on cooling was made, no packing station, as far as we know, was cooling poultry in slush ice,

but several of them are now using this method. This cooling system, widely practised in the United States, has been used as a medium for applying small amounts of "aureomycin," (chlortetracyeline), to the surface of eviscerated carcases so that these may be distributed as "fresh" poultry for up to three weeks after processing. It may be thought therefore, that the present large trade in Britain in uneviscerated poultry carcases could be changed "overnight" to one in "ready-to-cook" eviscerated carcases, simply by the inclusion of aureomycin in the water used to cool freshly killed birds. We believed that this process would not be so easily adapted to British practice since not only are wet methods of cooling rare, but refrigeration at all stages between packing station and consumer are most unusual. In the United States and Canada however, this is the usual practice. We have now completed a preliminary study of the use of aureomycin under conditions approaching those used in the United States and a comparison of these results with those obtained when some of the features of present British practice were retained. In view of the predominance of uneviscerated poultry in Britain the use of aureomycin with uneviscerated carcases was also studied although such an application has not been used in North America. A brief account of these experiments follows.

In order that the greatest amount of information could be obtained, all the birds used (140) were hatched and reared under controlled conditions at the Houghton Poultry Research Station. Variability between each bird was thereby kept to a minimum and the life history of each bird was known. At the packing station, after the birds had been killed and plucked, the carcases were divided into groups and given one of four treatments as follows:—

1. eviscerated and cooled in iced water containing aureomycin at 10 p.p.m. for 2 hrs.
2. eviscerated and cooled in iced water for 2 hrs.
3. eviscerated and cooled in water containing aureomycin at 10 p.p.m. for 2 hrs.
4. dry cooled on racks and then eviscerated—the usual procedure of the packing station.

A number of carcases which were not eviscerated were otherwise treated similarly.

All the processed carcases were then stored in constant temperature rooms at either 33.8°F or 59°F so that the effectiveness of aureomycin as a preservative was studied with and

without refrigeration in both packing station and store. The results for one hundred and forty carcases are summarized in Table 3.

TABLE 3

The influence of temperature on the keeping quality of poultry carcases that have been immersed in a solution of aureomycin.

Method of cooling	Aureomycin added	Mean number of days before carcase spoiled	
		Stored at +15°C(59°F)	Stored at 1°C (33.8°F)
Eviscerated			
iced water	+	4.0	22.5
iced water	—	2.0	12.0
water	+	2.0	17.7
Contact plate— no water	—	3.0	13.7
Uneviscerated			
iced water	+	5.8*	28.0
iced water	—	5.7*	26.0
water	+	5.7*	30.7
Contact plate— no water	—	5.7*	31.0

* "greening" observed on some carcases after 2 days and on all except one by 5 days.

American results have been confirmed when the carcases were kept in refrigerated storage at 33.8°F. But, from the point of view of British practice, the most significant result of the experiment is the complete failure of aureomycin to extend the storage life of eviscerated poultry carcases in the absence of refrigeration. A second feature of the experiment was the change in the pattern of spoilage brought about by the aureomycin. In the absence of aureomycin, the characteristic bacterial slime of spoiled eviscerated carcases finally appeared on those which had been both dry cooled and wet cooled. Where aureomycin was present, however, there was, at the end of storage life, an extensive growth of yeasts and moulds. This is a striking demonstration of the rapid growth of a micro-flora resistant to aureomycin and which, under traditional methods, is suppressed by the growth of the typical spoilage flora. No bacteriological studies were made, but the presence of such an abundant growth of moulds which are easily seen raises doubts as to whether bacteria of strains which are known to be resistant to aureomycin but whose

presence would not be detected by inspection alone, were also abundant.

Aureomycin had no effect on the storage life of carcases which were not eviscerated when the storage temperature was 59°F (summer conditions). The first signs of spoilage were usually green discolourations on the skin of the abdomen and vent, (termed greening) and aureomycin was without effect on these discolourations. A better method of application of aureomycin to combat this type of spoilage would probably be by administration to the live bird shortly before slaughter since it is the micro flora of the gut which is responsible for these discolourations. This aspect of the problem is being studied at present.

There were no signs of greening on any of the uneviscerated carcases stored at 33.8°F even after 31 days when all the carcases had an off odour.

The implication of these experiments is clear. The use of aureomycin as a preservative may be advantageous under suitable conditions, but it cannot be applied successfully in Britain until dry methods of cooling have been replaced by wet methods and until refrigeration has been introduced at all stages of the wholesale, distributive and retail trades. Such extensive changes would involve re-equipment of a large part of the British poultry industry.

(The work described in this paper was carried out as part of the programme of the Food Investigation Board, of the Department of Scientific and Industrial Research.)

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ANTIBIOTICS IN THE PRESERVATION OF POULTRY*

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The delivery of food in a safe and edible condition to the world population is a problem of great economic importance. Up to the point of sale there is considerable wastage, and one major cause of this is spoilage due to micro-organisms, especially bacteria.

The dramatic results achieved by the use of a relatively new group of substances, the antibiotics, in combatting bacterial infections in man and animals suggested to some workers that there might be a place for their application in the food industry to delay bacterial growth. In 1946, Curran and Evans first reported that penicillin and streptomycin were to some extent capable of reducing the bacterial spoilage of milk (1) (2).

More recently, the effect of other antibiotics in the preservation of meat (3), fish (4) and poultry (3) (5) (6) has been the subject of intensive investigation, with most encouraging results. Chlortetracycline, oxytetracycline, tetracycline and chloramphenicol will, to varying degrees, extend the freshness of these foodstuffs. This work has resulted in successful application in the American poultry industry, where chlortetracycline has been in commercial use for the past 12 months (7).

Briefly, an antibiotic is the product of growth of a micro-organism which, in very low concentration, destroys or inhibits the growth of certain other micro-organisms. When applied to a perishable food, such as poultry, it not only exerts an immediate bacteriostatic effect, but "builds into" the product a bacteriostatic protection for as long as activity persists in the traces of antibiotic which remain in, or on, the tissues after treatment. The essential requirement of any antibacterial substance is that it must be effective in inhibiting the growth of bacteria in concentrations which are non-toxic to man, and at the same time must not impair the quality of the product. In the past, many chemical substances have been employed for this purpose. However, a review of the work carried out more recently has led to the belief that certain antibiotics are likely to fulfill these requirements more

* Paper given at a conference of the United Kingdom Branch of the World's Poultry Science Association, held in London, England, December 6, 1956.

satisfactorily than those agents hitherto used (8).

The extent to which poultry will spoil is a well known fact, and this occurs not only under adverse conditions, but in the normal course of handling from the producer to the consumer. Furthermore, it has been demonstrated that the genera and species of contaminating organisms are numerous, although species of *Coliform* and *Pseudomonas* are especially prevalent (9) (10). The diversity of organisms is such that only those antibiotics which are effective against a wide variety of bacteria are of value in delaying spoilage. Antibiotics have been divided arbitrarily into "narrow spectrum" and "broad spectrum" groups, according to their range of activity. The narrow spectrum antibiotics, which include among others penicillin and streptomycin, do not have the ability to inhibit the numerous bacterial species inhibited by the broad spectrum antibiotics which, to date, consist of the three members of the tetracycline group and chloramphenicol.

Experiments have been conducted *in vitro* to determine the relative effectiveness of various antibiotics against this wide group of bacteria. A typical investigation is shown in Figure 1, when 10 antibiotics were tested against a control

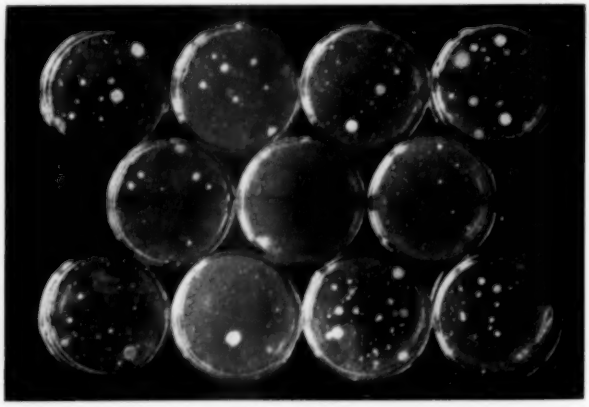

FIGURE 1.
COMPARATIVE EFFECTIVENESS OF VARIOUS ANTIBIOTICS IN INHIBITING GROWTH OF MICROORGANISMS FROM SPOILED POULTRY

Reading from left to right, the antibiotics added per ml. medium are:
Top row: None; chloramphenicol (10y), erythromycin (10y) proc. penicillin (10y).
Middle row: Neomycin (10y), *Aureomycin chlortetracycline (10y), streptomycin (10y).
Bottom row: Magnamycin (10y), polymyxin B (100 units), bacitracin (11 units), actidion (10y).
(Kohler, A. R., Miller, W. H., and Broquist, H. P. (1955))
*"Registered trade mark"

(5). A whole eviscerated chicken was allowed to spoil by letting it stand at room temperature for 2 days. The microorganisms were then washed from the surface of the chicken and, after suitable dilution, were added to plates containing nutrient agar. While the control plate containing no antibiotic, and certain of the other plates treated with antibiotics, showed varying levels of bacterial growth, the plate treated with chlortetracycline (a broad spectrum antibiotic) indicated complete inhibition of the spoilage bacteria.

Chlortetracycline belongs to the tetracycline group of antibiotics which also includes oxytetracycline and tetracycline; hence the success of one member of the group led to further experiments on the group as a whole. Eviscerated poultry was dipped for 30 minutes at room temperature in solutions containing 10 p.p.m. of chlortetracycline, oxytetracycline and tetracycline, then held in cold storage for 2 weeks. Figure 2 indicates that, while the tetracycline group is relatively effective in delaying putrefaction, there is a wide variation in activity within this group, chlortetracycline being the most effective (5).

The concentration of chlortetracycline required to inhibit bacterial growth is low. To determine an effective level, cut-up poultry was immersed for 30 minutes at room temperature in solutions which contained from 3 to 30 p.p.m., then wrapped and stored at 3°C. Weekly examinations showed that the untreated controls were spoiling in the first week, as evidenced by the bacterial count and organoleptic condition, while the solution containing 3 p.p.m. of chlortetracycline was sufficient to reduce the bacterial count 100-fold. At the end of the second week the birds which had been dipped in the solution containing 10 p.p.m. of chlortetracycline were in satisfactory condition (5).

Table 1 indicates this effect. Investigations by other workers have shown similar results (6) (11).

Practical Application

So far, we have been able to establish in general principle the place of antibiotics in food preservation, and indicate their potential value in the preservation of poultry. But, to the industry concerned, the practical application is an all important factor. In this, there are three considerations: (1) a suitable temperature for treatment, (2) the length of time poultry should be exposed to the antibiotic, and (3) the processing technique. In the first place, temperature affects the amount of chlortetracycline absorbed by chicken flesh—the

higher the temperature, the less is absorbed, hence low temperature treatment is preferable for efficient absorption. However, the amount absorbed does not only depend on temperature. The concentration of chlortetracycline in the dip solution, and the length of time the tissue is immersed, both have a proportional effect on the amount of chlortetracycline absorbed by skin and superficial muscle (5). Microbiological

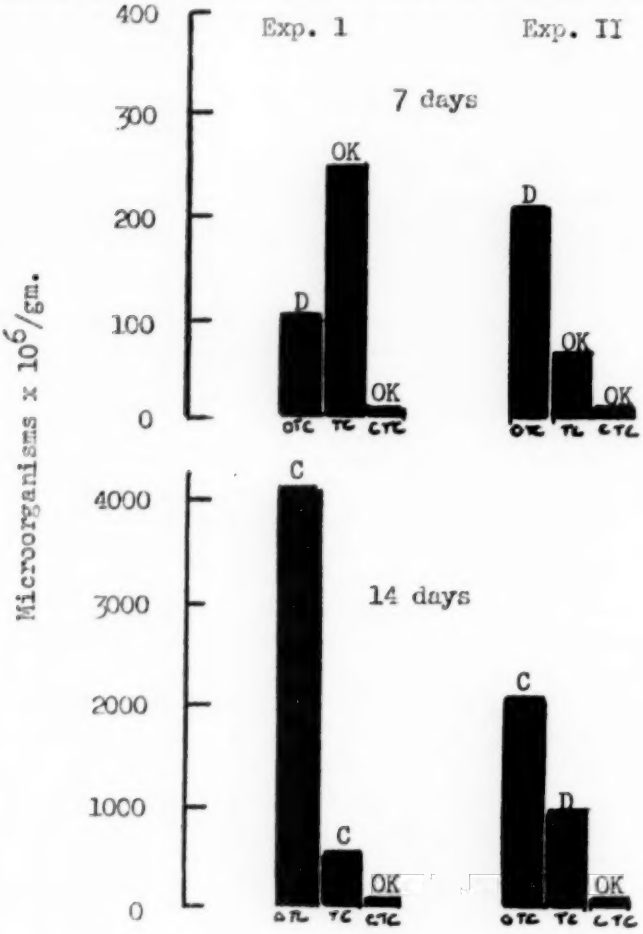

FIGURE 2.

COMPARATIVE EFFECTIVENESS OF TETRACYCLINE IN POULTRY PRESERVATION

CTC=chlortetracycline
OTC=oxytetracycline
TC=tetracycline
C=Slight odor
D=Very slight odor
OK=No odor or slime

(Kohler, A. R., Miller, W. H., and Broquist, H. P. (1955))

TABLE 1.

EFFECT OF AUREOMYCIN IN CONTROLLING SPOILAGE OF CUT-UP POULTRY DIPPED FOR 30 MINUTES AT ROOM TEMPERATURE

Experiment	*Concentration of Aureomycin Dip*	*Microorganisms x 10^6/G. Days in Cold Storage (3°C.)* 7	14	21
	μ/ml.			
1.	0	9.85[2]	23[2]	320[1]
	3	0.09[5]	37[4]	735[1]
	10	0.03[5]	6.2[5]	34[3]
	30	0.03[5]	0.11[5]	—[4]
2.	0	15[1]	164[1]	—[1]
	3	3.5[5]	40[3]	1040[2]
	10	0.14[5]	5.4[5]	28.5[4]
	30	0.04[5]	0.27[5]	5.6[4]

Legend: 1=Putrid
2=Strong odor
3=Slight odor
4=Very slight odor
5=No odor or slime.

(Kohler, A. R., Miller, W. H., and Broquist, H. P. (1955)) assay reveals that bacteriostatic levels of chlortetracycline are present in superficial tissues when freshly killed poultry is immersed for a half to two hours in a solution containing 10 p.p.m. of the antibiotic.

The amount of chlortetracycline which remains in the superficial tissues depends upon the temperature at which it is handled after treatment. At room temperature, there is a fairly rapid loss of activity within the first 72 hours; on cooking for 15 to 30 minutes, chlortetracycline is no longer detectable—even when there is 100 times more chlortetracycline than is recommended. Holding in chilled condition prolongs the effectiveness (5) (11). The fact that chlortetracycline delays the onset of immediate spoilage and is then completely destroyed on cooking, has encouraged the interest which surrounds its present or potential use.

The third consideration, that of processing methods, brings to light the difference in the treatment of poultry in the United States and this country. The work described so far in this paper has been based on the usual American processing technique, which involves the killing, dressing and evisceration of the birds, followed by chilling in tanks of ice-water, to which the antibiotic has been added, and finally packaging (14). In Great Britain however, birds are not normally treated in this way. Other experimental methods for the application of chlortetracycline, adopted in the United States, have

also given promising results (15). These include dipping the bird for 7 to 30 seconds in ice-water containing 100 p.p.m. of chlortetracycline; or alternatively, spraying for 10 seconds using the same concentration of the antibiotic.

In Great Britain, it is not the usual practice to eviscerate prior to cooling, although the possibility of chlortetracycline treatment may encourage early evisceration and chilled storage. The presence of the antibiotic on the peritoneal surfaces of the body cavity will, of course, assist in the control of internal spoilage after evisceration. Recently, discussion has appeared in the literature regarding the processing of poultry in the United Kingdom, and both early evisceration and chilling in iced water have been recommended (12) (13). The addition of an anitbiotic to the chilling water would add significantly to the advantages of this system of handling.

It is perhaps of interest to note that this process has now been extended in the United States to the preservation of giblets (14). Immersion for 15 minutes in a solution containing 10 p.p.m. of chlortetracycline affords adequate protection.

There are two further points regarding practical application which should not be overlooked. Antibiotic treatment of poultry is neither a replacement for refrigeration during storage, nor a substitute for good hygiene under which poultry should be handled. It is an adjunct to both. Holding poultry at chill temperatures after the recommended treatment (as described) is necessary if maximum benefit is to be achieved (11). Furthermore, chlortetracycline is not a disinfecting agent but rather exerts a bacteriostatic effect, that is, it does not kill bacteria but delays spoilage by preventing the rapid multiplication of the bacteria which contaminate the carcase after killing. Rapid chilling in ice-water, immediately after killing and evisceration, lowers the body temperature well below the level which is favourable to bacterial growth. From this solution, the antibiotic is absorbed into the skin and surface muscle tissue on which the bacteria lodge (5), hence further bacterial development is delayed while temperatures are low. Up to a certain point, the lower the bacterial count, the longer will be the storage life of the bird. If conditions of processing are not of a first-class standard of hygiene, then there will be a high degree of initial contamination before the antibiotic is applied, and the inhibition of bacterial development will be so restricted as to make the application useless. It cannot convert a sub-standard article into first-grade condition.

Benefits to be Expected

The obvious benefit in antibiotic treatment is the additional storage life of poultry, but as already stressed, this depends upon the initial condition of the bird, antibiotic processing and the temperature at which it is subjected during treatment and subsequent storage. While untreated poultry held in chilled storage will remain in edible condition for about 7 days, the shelf life of treated poultry under identical conditions is extended to between 14 and 21 days (5) (6). This effect is shown in Table 2.

TABLE 2.

EFFECT OF CHLORTETRACYCLINE CONCENTRATION IN EXTENDING "SHELF LIFE" OF CHICKEN HALVES, DIPPED FOR 10 MINS.

Expt.	*Concentration of Chlortetracycline Dip (P.P.M.)*	*Number of Days To Develop Off-Odour*
1	0	11.6
2	10	17.6
3	20	18.4
4	40	18.9

TREATMENT

Prior to dipping: 1. Birds dressed, and cooled for 2 hours in ice water.
2. Eviscerated and cut into halves.

After dipping: 1. Drained.
2. Packaged in polythene bags.
3. Refrigerated at 2.2°C.

NUMBER OF BIRDS IN EACH EXPERIMENT: 12.

(Ziegler, F. and Stadelman, W. J. (1955)

Antibiotic preservation of poultry is permitted for use in the United States, as well as in a number of other countries, where the conditions surrounding food handling and problems of food spoilage differ widely. This process then, represents a new concept in the field of food preservation. If extended to the poultry industry of this country, it could well ease some of the present problems of distribution.

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MANY NAKED-NECKS IN GREECE

While viiting commercial poultry producers in the Meghara area, about 40 miles west of Athens, I observed numerous small-sized village flocks, mostly mongrels, a large number of which had bare necks. Obviously they are descendants of the Transylvania Naked Neck breed of chickens. On a later trip in the northern part of Greece I saw more village flocks containing numerous Naked Neck chickens.

Not only are neck feathers absent, but also the area of skin lacking the feathers becomes loose, thickened, wrinkled and deep red in color during the period of sexual activity. This naked-neck character is due to a single dominant autosomal gene. (Morley A. Jull. U.S.O.M., American Embassy, Athens, Greece.)

POULTRY INDUSTRY OF LEBANON

M. EL-HASSANY
Beirut, Lebanon

Chickens should have been the first birds tamed by man, and so their life with him dates back to the dawn of civilization.

Lebanon, of course, has had its chickens for centuries, but their husbandry has not been modeled according to modern methods and techniques until very recently.

After World War II, there was a high demand for a better quality of both chickens and eggs. Lebanon, being a considerably advanced country in the Arab World and peculiarly situated to form a bridgehead between the East and the West, immediately realized the necessity of introducing new scientific methods into the poultry industry if it was to meet the pressing and ever-increasing high demand and if it was to prove economical and profitable.

Literature on the subject is abundant, but remains theoretical if no practical training accompanies it. So competent persons were chosen and sent to various European and American institutes to become acquainted with the up-to-date techniques not only in poultry but in every other industrial, agricultural, scientific, and educational field. I happened to be one of those, luckily enough, whose destination was Maryland University. Here I should not omit to narrate an interesting incident which, at the time, carried with it a touching memory and which at present, is very relevant to the subject I am writing about. In 1953 I went with Professor Quigley to Pennsylvania to one of the Hubbard annexes farms. When the man in charge met us, I was dressed up in overalls (incidentally, I am tall and fair, and speak with an American accent) and Prof. Quigley introduced me to the foreman as El Hassany from Lebanon. The man mistook me for an American and exclaimed "Hi, neighbor!" thinking that I was from Lebanon, Pennsylvania, not knowing that a distance of 7,000 miles separates Lebanon, Pennsylvania, from the original Lebanon.

For a period of 13 months, I acquired as much as I could of American ultra-modern techniques and returned to the country of Lebanon to apply to the greatest extent these techniques.

The Government over here owns Terbol experimental farm which consists of:

I. A laying house that holds 2,100 birds.

II. 1, a brooding house that holds 10,000 chicks; 2, a store for feed.

III. A unit consisting of: office, incubation room, lab, egg room.

Besides all of these, we have six demonstration centers.

Private concerns have also, since 1954, established 15 up-to-date poultry farms in various villages, each with a capacity of 2,500 birds and up. Some others are under construction.

Products of these farms can scarcely be found in the local market. Big companies operating in the deserts absorb their output. We import a lot of chickens and eggs from Syria, the neighboring country. Some are being consumed locally; others pass in transit to other Arabian countries.

It should also be mentioned that there are many chicken fanciers in Lebanon, and you can practically find any breed you may desire if you are prepared to pay the price.

The major problem that we face is our feed supply. Feed still lacks the animal protein ingredient. Although we import a considerable amount of concentrates from the U. S., the high cost makes many a farmer reluctant to add a percentage of this valuable ingredient to the daily feed. If concentrates are used in the mash in the required proportion, a hen will only yield a dollar and sixty cents a year, while if no concentrate is offered to the bird but satisfied with locally produced mash, the income from a hen rises up to two dollars and seventy cents per year. This is the most intricate, as it involves economy on one hand versus high production and quality on the other hand.

Management leaves much to be desired. Where healthy and comfortable pens are provided, feed and hygiene remain unattended to. Hatching and chicken raising still suffers from high mortality owing to bad selection and lack of disease control, besides no pullorum tests are followed by the hatcheries.

Despite the many misgivings of the industry, the young modern poultry industry in Lebanon has developed fast since 1954, and gives every hope of a flourishing future.

MORE SMALL FARMS WITH POULTRY IMPERATIVE and DEVELOPING A MORE PROFITABLE POULTRY INDUSTRY IN ITALY

MORLEY A. JULL

c/o Agricultural Attache, American Embassy, Rome, Italy

One great drawback of Italy's poultry industry is that there are several thousand farms of three acres or less on which practically no poultry is kept. That means that the families on these farms are unable to obtain any income from eggs and poultry that might well be produced, at least on a limited scale.

Another great drawback of the poultry industry of Italy is the fact that the imports of hatching eggs, baby chicks, market eggs, and live and dressed poultry cost so many millions of dollars ever year. Italian poultry breeders and producers should be in a position to produce these items and thus profit materially.

Producing Hatching and Market Eggs.—The cost of producing hatching eggs is somewhat more than the cost of producing market eggs because the cost of the males and their depreciation from the beginning to the end of the breeding season is one item of expense not involved in market egg production. Also, in the case of "hatchery" flocks, the males used replace the same number of females that would otherwise be kept in "market-egg" flocks. In addition, the hatchery flock should be fed a slightly more expensive mash than the market-egg flock need be fed. For the most part, hatching-egg production should be left to poultrymen who are able to carry on a progressive breeding operation on a considerable scale. It would be interesting if the Ministry stimulated interest in this direction.

The economic returns secured from the laying flock kept primarily for the production of market eggs are affected by such factors as the average egg production per bird during the laying year, the proportion of pullets to older birds in the flock, the extent of culling out the poor layers, the cost of feed, and the price of eggs. Market egg producers should realize that when feed prices are relatively high it is most important to practice efficient flock management, keep mortality at a minimum, have a high percentage of pullets in the laying flock, and eliminate the poor layers as soon as they are detected.

Reducing Hatching Egg and Chick Importations.—Instead of importing several million hatching eggs and baby chicks yearly, every encouragement should be given to the more progressive poultry breeders to develop one of two kinds of breeding flocks: either a strain noted for high egg production or a strain noted for rapid growth and plump breasts.

Increasing The Profits of Breeders and Producers.—In order to make the poultry industry more profitable for Italian poultry breeders and producers, certain suggestions are offered whereby the national program aimed at improving conditions in the industry can be made more effective. These suggestions are made in connection with each of the different types of organizations that have been developed to carry on a particular activity.

The National Poultry Federation (Federazione Avicola Nazionale) is a private poultry organization having a general interest in the welfare of the poultry industry as a whole. The president of the Federation is the Honorable Ferolinande Demarchi.

The Italian Ministry of Agriculture, with headquarters at Rome, carries on a considerable amount of extension work of direct interest to poultry breeders and producers. Dr. Raffalle Quilici is the head of the Ministry's Poultry Section. He is also in charge of the poultry research station at Rovigo, not far from Rome. For the first few years, the research work carried on was of an academic rather than practical nature, but now experiments of direct interest to poultry breeders and producers are being carried on.

The Ministry of Agriculture has four Poultry Centers and eleven Poultry Observatories located in different parts of Italy. Extension and demonstration work is carried on for the benefit of farm poultry people. One of the first projects carried on was to substitute chicks of good breeding in place of chicks produced locally. Farmers sign a contract to do away with their local flocks and in some cases agree to sell eggs for hatching. Another extension project involved giving small mechanical brooders to the Demonstration Centers which loaned them to farmers who bought day-old chicks and agreed to use a recommended feed for a two-week period. It is hoped that, henceforth, the Ministry Officials will give special attention to small-farm holders, many of whom have never had a chance of keeping any chickens. The best quality of "bred-to-lay strains" of chicks should be made available.

Just the other day, I learned of another Ministry activity that would be of particular benefit to thousands of farmers on very small acreages. The Ministry was providing farmers with plans of practical poultry houses and, in addition, assisting the farmers in some way in the construction of the houses.

Research Work Very Important— It seems to me that it would be very desirable for the Ministry of Agriculture to establish a Ministry Poultry Experiment Station and Demonstration Farm somewhere in the Po Valley and another one in central or southern Italy. I suggest this because during my brief stay in Italy, I learned of very little experimental or research work being carried on with the object of developing a more efficient poultry industry that would yield more profitable returns to poultry producers and those who market eggs and poultry. These experiment stations and demonstration farms should be equipped with up-to-date incubation and brooding facilities and should be planned for conducting experiments on breeding and nutrition, the most efficient egg and poultry meat production and on flock management to control diseases.

By all means, some experimental work should be carried on by the poultry departments of some of the universities or by Ministry officials concerning the feasability of producing baby broilers, which are marketed at six to eight weeks of age and weigh about 14 to 16 ounces eviscerated. Baby broilers have become very popular in the United States.

At each of the Universities of Bologna, Milan, and Perugia there is a poultry department but apparently they lack sufficient funds to conduct as many experiments as would be desirable for the benefit of the poultry industry.

More Effective Extension Work.—Professor Landi, geneticist on the staff of the University of Florence and Professor James F. Keim, extension consultant of the Ministry of Agriculture discussed in separate meetings, the poultry extension work being carried on by different agencies. I got the impression that while quite a bit of excellent extension work is carried on by Ministry personnel and by University authorities, there is much need for more effective demonstration work among flock owners on how to carry on improved practices to get better results.

Dr. Tucci Salerno, and Dr. Sannino, Naples conduct poultry production short courses at Salerno under the auspices of the Ministry of Education. Professor D. Genova, Naples,

carries on a worthwhile program to encourage poultry production. At Caserta, in southern Italy, there is a progressive producer's organization. Professor Keim would like to see improvements made in the methods of carrying on extension work. Well illustrated leaflets, pamphlets, and posters on specific subjects would be of tremendous help to farmers.

Combatting Poultry Diseases.—The high mortality that occurs annually in flocks of growing chickens and laying hens is one of the outstanding drawbacks of the whole poultry industry. Not only is the economic loss from chickens dying during the growing period and from hens dying, during the laying year very great, but in addition there should also be counted the cost of retarded growth, poorly finished market birds, and decreased egg production among the birds that manage to live but are infested with parasites and infected with disease organisms. Poultry growers should be kept thoroughly posted concerning the most effective methods of keeping poultry diseases under control.

I had the pleasure of visiting the zooprophylatic institute (animal pathology laboratory), a short distance from Rome, and was favorably impressed with the laboratory facilities. Under the direction of Professor Vittorio Zavagli, an extensive pullorum-testing program is carried on every year and many birds from different parts of Italy are diagnosed for disease. In order to serve poultrymen in all parts of Italy effectively, it would seem that several well-trained poultry pathologists might well serve as extension specialists, with their headquarters at the ten or eleven pathological laboratories located in different parts of Italy.

Egg and Poultry Marketing Problems.—Having discussed egg and poultry production problems of interest to producers and to Ministry and University officials, it is appropriate now to turn to problems involved in marketing eggs and poultry.

The importance of preserving the superior quality of fresh-laid eggs cannot be overemphasized because the quality of market eggs affects their price, the number consumed, and the costs of marketing them.

In order to be able to market the highest possible percentage of eggs possessing the superior quality that is characteristic of fresh-laid eggs, only infertile eggs should be produced except during the hatching season. During hot weather, fertile eggs that are not kept in a cool place spoil quite quickly.

The internal temperatures of dressed birds should be reduced as quickly as possible to nearly 34°F after dressing operations have been completed or bacterial decomposition is liable to take place and cause the flesh to become tainted, especially in warm weather.

If dressed and eviscerated poultry is to be held for a while before being marketed, especially during warm weather, it must be quick-frozen and held in that condition until marketed. Some indication of the increased interest in Italy in quick-freezing poultry is the fact that the June 1956 issue of Italy's poultry journal El Giornale dei Pollicoltori devoted several pages to a report of the proceedings of the Fifth National Congress on Refrigeration held at Padova, Italy, June 3, 5, 1956. The quick-freezing of eviscerated poultry in Italy will probably await the installation of refrigeration in meat shops.

Also, in the not too distant future, egg and dressed and eviscerated poultry regulations will be promulgated and eggs and poultry will be sold on a graded basis. Market eggs are graded according to size, cleanliness and soundness of shell, size of air cell, relative firmness of the albumen and the color of the yolk and its freedom from blood spots and discolorations. Dressed and eviscerated or ready-to-cook poultry is graded on the basis of the following factors: body conformation, fleshing over the breast, fat underlying the skin, and freedom from pinfeathers, bruised or torn skin, broken bones, and other defects.

All of these matters and related problems are of much interest to the Agricultural Attaches of the U. S. Embassy in Rome. They are also interested in the monthly market prices of eggs, poultry, and feed in Italy in relation to their effects on the market development programs for United States farm products, such as feed grains. The Attaches service the Embassy needs in agricultural matters and are interested in public relations in agriculture.

Finally, the normal increase in the human population that is bound to take place in Italy during the next several years will give rise to a constantly increasing demand for poultry products of superior quality. May the Italian poultry authorities do their utmost to fulfill the obligations thrust upon them on behalf of poultry producers.

ITALY'S EXPANDING POULTRY INDUSTRY

MORLEY A. JULL
c/o Agricultural Attache
American Embassy, Rome, Italy

Having been evacuated from Cairo, Egypt, on October 31, 1956, and having arrived in Naples, Italy, on November 6, my services were requested shortly thereafter by Mr. W. Raymond Ogg, American Embassy, Rome, Italy. I was asked to enquire into the status of the poultry industry as a branch of agriculture and make a survey of the activities of the Italian Ministry of Agriculture, the Universities, and farm organizations in promoting the welfare of the poultry industry.

Mr. Ogg, and Assistant Agricultural Attaches Paul J. Findlen and Earl S. Fox cooperated in every way to make my study worthwhile.

The poultry industry is a valuable asset to the people of Italy because it not only provides consumers with highly nutritious food products, but egg and poultry meat production can be carried on more advantageously than numerous other agricultural enterprises on small farms, of which Italy has so many.

During the past few years, Italy has increased her annual production of eggs and poultry meat, but during this time her imports of these products have greatly exceeded her exports.

Italy's laying-flock population is estimated to be about 80,000,000. About 6,000,000,000 eggs and about 160 thousand metric tons of poultry meat were produced in 1955. About 33,247 metric tons of eggs were imported and about 192 metric tons of eggs were exported. Imports of poultry, mostly from Denmark, Hungary, the Netherlands, Poland, and Yugoslavia amounted to about 20,000 metric tons whereas exports amounted to about 76 metric tons.

Since animal food products are of particular importance in providing proteins of animal origin for human diets which are thereby greatly improved nutritionally, it is interesting to note that in terms of metric tons produced in 1955, the most important livestock products ranked as follows: milk, beef, eggs, pork, mutton, (including lamb and goat meat), horsemeat, and poultry and game. Some sheep milk is made into cheese.

More important to the producers and consumers of animal food products is the relative value of these products, but unfortunately comparative prices are not at hand. Since the farm women, especially in southern Italy, usually sell the eggs and poultry produced on the farm, they are very conscious of the relative price of eggs as compared with the price of other animal products sold from the farm.

The great influx of summer tourists into Italy every year leads to a greatly increased demand for eggs and chicken meat during the summer and fall months. Khaki Campbell ducks for egg production are kept on many farms. In 1955, about 3,000,000 baby chicks were imported for broiler production, the chief source of supply being Belgium, Denmark, England, Holland, and West Germany.

There is a marked preference for fresh eggs although I have seen eggs in the stores in Rome that might well have been a little cleaner and somewhat larger. I read a statement the other day to the effect that many imported eggs are inclined to have dark yolks whereas Italian consumers prefer eggs with light yellow yolks.

There is a recent Italian law requiring each imported egg to be stamped showing the country of origin. Eggs are sold in stores that also sell lamb, poultry, and game birds. The game birds are sold with the feathers on and the dressed chickens are sold with a "collar" of feathers around the neck at the base of the skull. This custom will probably disappear in time, since it apparently serves no useful purpose. Poultry slaughter houses are inspected by Italian government authorities. It has been stated that there is no dollar exchange available for importing dressed poultry from the United States.

On the other hand, the demand for hatching eggs and baby chicks produced by outstanding bred-to-lay strains and faster-growing meatier-type strains is bound to increase unless Italy produces its own.

EFFICENCY OF FEED UTILIZATION IN EGG AND CHICKEN-MEAT PRODUCTION VERY IMPORTANT

The feed consumed by the various classes of livestock usually constitutes by far the largest cost factor in producing animal-food products for human consumption. Well balanced diets, particularly with respect to the quality of protein and the combination of vitamins and antibiotics in the feed are very important in determining the efficiency of egg and poultry meat production. Competent flock management is very important in determining the results secured, especial-

ly with respect to controlling losses from disease. The most basic factor of all, however, affecting the efficiency of egg and poultry meat production, is the breeding worth of the birds.

A 4-pound layer, such as a White Leghorn, laying 100 eggs a year consumes about 8.3 pounds of feed per dozen eggs produced whereas another White Leghorn of the same size laying 200 eggs a year consumes about 5.0 pounds of feed per dozen eggs produced. It is obvious, therefore, why breeding for high egg production in Italy is so important.

The body size of layers affects the efficiency of feed utilization in egg production. The larger the body size of the layer, the higher is the proportion of the feed consumed that is used for body maintenance. For instance, whereas a 4-pound bird laying 100 eggs a year consumes about 56.5 pounds of feed for body maintenance, a 6-pound bird laying 100 eggs a year consumes about 73.6 pounds of feed for body maintenance. The important difference between these two layers is that the 6-pound bird consumes an average of 2.2 more pounds of feed per dozen eggs produced than the 4-pound bird. Of course, for the most part, 6-pound birds would lay slightly larger eggs than 4-pound birds and they would be worth a little more when marketed.

Broilers consume fewer pounds of feed per unit of gain in weight than any other meat-producing domestic animal. Hogs require the smallest amount of feed per calorie of food energy produced, most of which, however, is in the form of subcutaneous fat. Turkeys consume more feed per pound of gain in weight than hogs, but turkeys produce protein cheaper, protein of animal origin being very important in human nutrition. Beef cattle consume more feed per pound of gain in weight than any other class of domesticated meat-producing animal. The pertinent data pertaining to these factors are given in Table I.

The data in Table I show conclusively that with respect to the production of lean meat as a source of animal protein, broilers are very much more efficient than cattle and hogs.

That the poultry industry in Italy is likely to expand relatively more rapidly than other livestock enterprises is clearly indicated by the three following paragraphs taken from the 1957 Outlook Issue of "The Poultry and Egg Situation" published by the Agricultural Marketing Service of the United States Department of Agriculture.

TABLE I. FEED-CONVERSION EFFICIENCY IN MEAT PRODUCTION BY KIND OF LIVESTOCK, 1949-1953

RONALD L. MIGHELL AND ORLIN J. SCOVILLE

Agricultural Economics Research, Oct. 1956, Vol. 8, No. 4

Kind of Livestock	Feed units consumed per 100 pounds livestock	100 pounds meat and fat excld. bone	100 calories food energy	pound of protein
	Including pasture			
Broilers	359*	674	834	34
Hogs	515	819	324	95
Turkeys	543	885	740	44
Cattle and Calves	952	2186	1552	138
	Excluding pasture			
Broilers	359*	674	834	34
Hogs	490	779	309	90
Turkeys	518	828	706	42
Cattle and Calves	577	1325	940	84

*This figure for broilers does not include the feed used in producing "hatching" eggs. Correction for this would add about 5 percent to the data in the table. Therefore, 359 plus 5 percent = about 377 pounds.

"Within the poultry industry itself there seems to be a built-in factor toward expansion of output. Most of the innovations or efficiencies have the effect of increasing output."

"In egg production, for example, a rising rate of lay per hen housed is the expression of advances in management, health practices, nutrition, and genetics. With a given population of laying chickens, the result is a larger egg production, with recent increases in rate of lay per bird—by coincidence—about matching the percentage increases in the human population. In addition, certain innovations in management and methods increase the number of birds which can be tended by the poultryman, and the effect there tends to increase average flock size, a trend which is another source of built-in increases in egg production."

"In poultry meat production, one of the outstanding expressions of greater efficiency is in the reduced period of time required to bring a broiler or turkey to marketable weight. For broilers, this offers the possibility for four or five broods per year being produced with facilities that previously had sufficed to rear only 3½ broods to an identical average weight. For turkeys, it has stimulated an interest in multiple broods, and has been a factor in the year-round production of those birds, again resulting in increased output. Also, emphasis on larger and larger flocks, without correspondingly increased labor requirements, tends toward larger total output exactly as is the case in egg production."

MICROFILM SERVICE

The World's Poultry Science Association has entered into an agreemeent with University Microfilms, Ann Arbor, Michigan, U.S.A. to make available the World's Poultry Science Journal in microfilm form.

Microfilm makes it possible to produce and distribute copies of journals on the basis of the entire volume in a single roll, in editions of 30 or more, at a cost approximately equal to the cost of binding the same material in a conventional library binding.

Under the plan the library keeps the printed issues unbound for circulation. When the paper copies begin to wear out or are not called for frequently they are disposed of and the microfilm is substituted.

Sales are restricted to those subscribing to the paper edition and the film copy is only distributed at the end of the volume year.

The microfilm is in the form of positive microfilm and is furnished on metal reels, suitably labeled. Inquiries concerning purchase should be directed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan, U.S.A.

MORE EGGS AND POULTRY MEAT NEEDED IN DIETS FOR GREECE'S RAPIDLY INCREASING POPULATION

MORLEY A. JULL

USOM/Greece, American Embassy, Athens

While working for the Agricultural Attache and his assistants in Rome in December, I was informed that my services were requested in Greece. Upon arriving in Athens, I was advised that Mr. Eleftherios Papadopoulos would serve as interperter for Greek Government officials, poultrymen, and myself. His nickname being "Lefty" solved the problem facing me because many Greek names are real tongue-twisters.

I might mention in passing that two Greeks are members of the Worlds Poultry Science Association.

The population of Greece (about 8,000,000) is increasing at the rate of about 1.25 percent per year, which is nearly twice the rate of increase in most European countries. Not over 25 percent of the land area of Greece is under cultivation. The grain crops are principally corn and wheat. Berseem, vetch, and other kinds of green-feed crops are grown extensively.

According to the 1954 report entitled "Can Greece Feed, Clothe, the House its Growing Population?", submitted by the Director of the Advisory Group on Land and Water Resources Development, the calorie intake per person is lower in Greece than in any European country except Spain and lower Italy.

What is really needed in Greece is the production of more animal-food products in order that the Greek people may have better balanced diets that contain more animal protein than diets made up almost entirely of cereals, fruits and vegetables.

Poultry and Other Livestock Enterprises:

The chief livestock enterprises are cattle for meat and milk; sheep for meat, milk, and wool; goats for meat and milk, and poultry for eggs and meat. In 1955, over 37,000 metric tons of eggs were produced as well as 14,556 metric tons of poultry meat, the latter amounting to only about 11 percent of all meat produced. There are relatively few turkeys, ducks or geese raised in Greece.

Of the total poultry population of about 12,000,000 chick-

ens in 1955, approximately 850,000 were in commercial poultry flocks and about 11,150,000 in farm flocks. The commercial flocks are mostly near the larger cities of Athens, Piraeus, Patras, Corinth, Kalamata and Salonika. In the commercial flocks, the average egg production per bird is about 150 whereas in the farm flocks it is about 80. In other parts of Greece the average egg production of commercial flocks is about 115 and the average egg production of farm flocks is about 60. Obviously there is much need for the adoption of improved methods of breeding, feeding, and flock management to develop more profitable laying strains.

Since the price of eggs produced in Greece is fixed by the Ministry of Commerce although the price of feed is not fixed, it is perfectly obvious that market egg producers must keep strains of birds bred for high egg production. In addition, the laying flock should be fed well balanced diets that will enable the birds to produce eggs on the fewest possible pounds of feed per dozen. Also, it is extremely important to manage the laying flock as efficiently as possible in order to avoid excessive losses from disease and parasites.

In some respects, breeding to increase egg production is relatively more important than breeding for more efficient poultry-meat production. This is because among the various kinds of animal foods produced for human consumption, eggs are in a class by themselves whereas poultry meat is in competition with beef, lamb, and pork and in some countries with goat meat and in still some other countries with horse meat.

Breeding for More Profitable Egg Production:

Since by far most of the grain and meat meal and fish meal fed to the laying flocks in Greece are imported from distant countries, it is obvious that their cost to poultry producers includes the cost of the grain and fish and meat meal in the country in which they are purchased and the shipping charges. The reason that these items are mentioned in connection with the discussion on breeding for increased egg production is because the cost of feed is by far the largest single cost factor in producing eggs, amounting to from 60 to 65 percent in most cases, probably more in Greece.

Mr. M. G. Georgandas, about 15 miles from Athens, is carrying on a very sound program of progeny testing White Leghorns to increase their laying ability. In some respects he was keeping more records with respect to certain traits

than were necessary but fundamentally his program is sound.

Another progeny-testing program to develop high-laying strains of White Leghorns is an extensive program being carried on by Mr. A. M. Syrigos, 8 Guilford Street, Athens. He has 5,000 birds under trapnest and has been in business for seven years, during which time he has been breeding for resistance to leukosis and says that for the past year he did not have over three percent laying-flock mortality. His pen matings consist of one male and 15 to 20 females, all of which laid at least 280 eggs during their first laying year.

Renewing the Flock:

In all countries, hatchery operators perform a very important function in making chicks available for poultry raisers and for poultry breeders, although in the United States and certain other countries most poultry breeders own and operate their own hatcheries. During my tour of duty in Greece I became quite interested in the operations carried on by Mr. P. Kyvelos, who I presume was typical of many other hatchery operators in Greece. He secured his eggs from a number of supply flocks which had been selected to a limited extent on laying ability.

A. M. Syrigos (right) interviewing visitors in front of laying house. The men at the left are Eleftherios Papadopoulus, Greek Government interpreter, Morley A. Jull, U.S.O.M., Athens and Egypt; Dr. Hans Engler, Head of Animal Production Section, FAO, Romee, Italy.

He has a well constructed Stephens incubator (English make) of 25,000 egg capacity, the unique feature of the incubator being that it turns the eggs automatically every three hours, a very desirable feature from the standpoint of securing good hatchability.

Mr. Kyvelos has his own flock of 800 Danish White Leghorns and imports males from a breeder in the United States every year. Last year his flock averaged 190 eggs per bird. In terms of U. S. currency the price of day-old chicks is 22 cents, 35-days old females 70 cents, 60-days old females 91 cents, and 75-days old males, sold for meat, and weighing about 3 pounds, at one dollar.

Mr. Syrigos operates a hatchery of 45,000 egg incubator capacity and sells chicks to commercial egg producers and poultry breeders. There are numerous other hatcheries in different parts of Greece.

Preparing Mixed Feeds for Poultry:

In addition to the breeding quality of chickens and other classes of poultry raised for egg or meat production or both, the kind of diet they are fed is extremely important in determining the results secured. In the United States during recent years, and to a certain extent in certain other countries, remarkable advances have been made in determining the proper balance with respect to the respective amounts of energy and of protein that should be provided for broilers and for laying hens as well as with respect to the proportions of amino acids and vitamins that should be included in order to permit the birds to render their best performance. Not only the level but the source of protein is of some importance.

The problem of preparing feed mixtures for various classes of poultry has become so important in the United States that each of the States in the United States has a State Feed Inspection Service to make sure, in so far as possible, that various feed companies comply with respect to certain requirements concerning the proportion of certain ingredients they offer for sale.

In the United States and perhaps in some other countries, the various feed manufacturing companies which prepare mixed feeds for different classes of poultry attach a tag on each bag of mixed feed giving the formula or proportion of the different nutrients. The American Feed Manufacturers Association is a national organization in the United States

that is supported wholeheartedly by the private feed-mixing companies with the result that poultry producers have confidence in the formulas printed on the tag attached to each bag.

It would be wonderful if the Ministry of Agriculture of Greece could provide battery brooders and other facilities for properly qualified persons in the Military and in the colleges of agriculture to carry on nutrition research with growing chickens and also provide them with pens in laying houses for conducting research on the nutritional requirements of laying hens for high egg production. Anything that can be done to improve the quality of the diet for chickens and reduce its cost will be of much benefit to the egg and poultry meat producers of Greece.

Keeping Poultry Diseases Under Control:

Greek poultry flocks suffer from the ravages of the same diseases and from the attacks of the same kind of lice and mites as poultry flocks in other countries. Professor John Demacopoulos, Professor of Animal Husbandry, High Agricultural School in Athens, is certain that leucosis is the most serious disease threatening the poultry flocks of Greece.

A flock owner by the name of Papsinos had a flock of 2,000 White Leghorns and crossbreds secured from matings of New Hampshire males and White Leghorn females. He claimed that the purebred White Leghorns laid better than the crossbreds and that the crossbreds suffered more from leucosis than the purebreds.

I encountered one flock inflicted with staphyloccosis, chronic arthritis and swelling of the joints of growing chickens being the outstanding symptoms. Treatment with penicillin is effective.

Mr. Kyvelos surprised me when he said that he did the pullorum testing of his own hatchery flocks and he surprised me still more when he told me that he did not think that the Ministry of Agriculture trained poultry pathologists do the testing. It is hoped that some time in the near future pathological laboratories for the proper training of testers and for diagnostic work will be established at logical places in Greece and that extension poultry specialists will be trained to advise flock owners how to manage their flocks in order to keep them relatively free of disease.

Marketing Eggs and Poultry:

The net returns secured from the poultry enterprise are

determined to a considerable extent by the care and attention given the eggs and the poultry from the time that they are ready for market up to the time that they are marketed.

With respect to the marketing of eggs, market egg producers in the Athens and Piraeus areas should be very grateful for the efficiency of operation of the egg marketing cooperative located in Athens. About three-fourths of the eggs marketed through the cooperative are obtained from an area within a radius of about 25 miles from Athens. The balance of the eggs marketed through the cooperative are delivered by bus or plane from Salonika and other market-egg producing centers.

A government representative supervises the project and a State veterinarian determines whether or not each egg is in good condition and the plant is kept in sanitary condition.

The cooperative operates every day of the year except Christmas and a few other holidays. During the high egg-production season, 160,000 to 170,000 eggs are candled and packed daily. Only about one-half percent of the eggs contain blood and only between 7 to 8 percent of the eggs received are rejected.

There are 10 employees, including people working in the office and the veterinarian, who is appointed by the State but paid by the Co-op. There are 65 laborers who do the candling, grading, stamping, packing, loading, and unloading. All eggs are sold in the Athens and Piraeus area.

The Co-op publishes a monthly poultry magazine. I was very favorably impressed with the efficiency of operation of the entire unit, and am grateful to Mr. Theodore Yannopoulos for spending the time he did in explaining things to me. The Co-op means more money to the producers.

In conclusion, I am happy to report that the Ministry of Agriculture personnel and the Greek poultry producers are really anxious to learn how to improve the economic conditions of the poultry industry. They asked very many questions. With the very able assistance of Mr. Eleftherois Papadopoulos in interpreting their questions and my answers, I sincerely hope that everything possible will be done to increase the efficiency of egg and poultry meat production to the utmost.

REVIEW OF POULTRY PUBLICATIONS

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GENETICS

BORZEDOWSKA, B. 1956. [Nat. Zootech. Inst., Cracow.] Wplyw obcego bialka na wlasciwosci dziedziczne ptakow.

THE EFFECT OF FOREIGN ALBUMEN ON THE HEREDITARY PROPERTIES OF BIRDS. *Pam. Inst. zzootech. Polsce*, 1955: 13-38.—The exchange of albumen between Polish Greenleg and White Leghorn eggs, and parabiosis between incubating eggs of these breeds, caused certain changes in pigmentation in the resulting chicks. The occurrence of pigmented feathers in W.L.s from treated eggs is apparently a heritable character [but, according to information received since the paper was written, the colour tends to diminish in later generations]. Egg albumen transfer between fowls and ducks failed to result in any transmissible changes. *(Animal Breeding Abstracts)*

FISCHER, H. 1956. [Inst. Anim. Breed., Univ. Indonesia, Bogor.] Angeborene Zehenverkrümmung, ein Erbfehler beim Haushuhn.

CONGENTIAL CROOKED TOES, AN INHERITED DEFECT IN THE DOMESTIC FOWL. *Arch. Geflügelk*, 20: 118-127.—As the occurrence of crooked toes among Australorps and newly-purchased stock of the Indonesian Kedu breed at the Animal Breeding Institute could not be attributed to unfavorable environmental conditions, test matings were made within the breeds to determine (1) whether the defect was inherited and (2) its mode of inheritance. It was shown that in the Kedu breed crooked toes is an inherited condition; it may occur in either sex, in one or in both legs, and is due to a simple autosomal recessive gene with incomplete penetrance. In the Australorps the mode of inheritance is not yet clear; the penetrance of the factor concerned appears to be very low. *(Animal Breeding Abstracts)*

FISCHER, H. 1956 (Universitas Indonesia, Bogov)

TORTI COLLIS IN CHICKEN. *Hemera Zoa* LXIII. 341-342.—During breeding experiments to clarify the mode of inheritance of the congential crooked toes in chicken an Australorp hen was born in the poultry department of the institute with a crooked neck, besides this the bird has curled toes on both legs.

Torti collis is known in man, horse, cattle, sheep and some other mammalians as an inherited defect. In the fowl it has been reported only one time by Jull and Quinn (1931). It seems to occur rarely in both males and females. The attempts to interbreed birds with the defect have been unsuccessful. If the chicken grows older the defective

conlition becomes worse so that the birds are unable to mate or even to walk normally. "Crooked neck" females rarely laid any eggs.

The bird in question hatched on October 29, 1955, and developed normally with its group from the incubator. The neck is twisted to the left side. The hen is able to walk and eat and it is hoped that she will grow up to maturity. She is now isolated with a phenotypically normal halfbrother for a breeding trial.

Jull and Quinn (1931) could prove in a large scale breeding experiment with heterozygote birds in which 129 normal anl 27 "crooked neck" progeny were born, that the defect is transmitted as a single recessive factor. They believe that the malformation is caused by the cessation in the growth or the misplacement of one or more of the numerous ligaments of the vertebrae. (Author's summary)

GERICKE, A. M.
BREEDING OF POULTRY FOR RESISTANCE TO DISEASES AND VIABILITY. *Farming in South Africa 31 : 360* 187-192, 206. (1956).—A general review is given of mortality in poultry, infectious diseases, nutritional deficiencies and the procedure in breeding for resistance and viability.

GLEICHAUF, R. 1954. Die Chromosomenkarte des Haushuhnes.
THE CHROMOSOME MAP OF THE DOMESTIC FOWL. *Celler Jb.*, 1953: 104-110. *(Kleintierz. Forsch. Lehre, 2.)* From *Jb.* Geflügelz., 1954. *Stuttgart [presently at Ludwigsburg]: E. Ulmer.* Pp 183-194. —The estimated relative positions of 23 genes on 6 of the chromosomes of the domestic fowl are shown diagrammatically. Eight loci are marked on the X chromosome, 4 loci on the best-known autosome, 3 each on 3 other autosomes, and 2 on the remaining autosome. Notes are given on the mode of inheritance of the various characters involved. *(Animal Breeding Abstracts)*

GODFREY, GEORGE F., and **BILLY L. GOODMAN.** (Oklahoma A. and M. Coll., Stillwater.)
GENETIC VARIATION AND COVARIATION IN BROILER BODY WEIGHT AND BREAST WIDTH. *Poultry Sci. 35(1):* 47-50. 1956.—Heritability estimates, and estimates of genetic, environmental, and phenotypic correlations were calculated for 1 hatch each of New Hampshires and Silver Oklabars from variance, and/or covariance components, and by regression methods. Heritability estimates for 9-week body weight averaged about 0.5, while those for 9-week breast angle averaged about 0.4. A positive genetic correlation of 0.5, an environmental correlation of about 0.3, and a phenotypic correlation of about 0.3 existed between 9-week body weight and 9-week breast angle. No significant differences due to breed were evident in the estimates calculated. In these 2 populations, selection for broiler body weight should result in concurrent improvement in breat angle.—G. F. Godfrey. *(Biological Abstracts)*

GOODMAN, B. L., and **GEORGE F. GODFREY.** (Oklahoma A. and M. Coll., Stillwater.)
HERITABILITY OF BODY WEIGHT IN THE DOMESTIC FOWL. *Poultry Sci. 35(1):* 50-53. 1956.—Heritability estimates were calculated from variance components and intrasire regression of offspring on dam for 9-week body weight and mature body weight for 4 generations of New Hampshires and Silver Oklabars. Estimates for heritability of 9-week body weight averaged 0.43; those for mature pullet body weight averaged 0.47. Individual selection is the most efficient selection method to improve body weight in these populations.—G. F. Godfrey. *(Biological Abstracts)*

McCARTNEY, MORLEY G. (Pennsylvania State U., University Park.)
HERITABILITY OF EGG WEIGHT IN WHITE HOLLAND TURKEYS. *Poultry Sci. 35(1):* 230-231. 1956.—Heritability estimates for May egg weights were based on female progeny of 18

single-sire matings with 93 dams over a 3 year period. Heritability value estimated from full sister correlations was 42.3%. There was some evidence of the existence of material effects on egg weight in turkeys.—M. G. McCartney. *(Biological Abstracts)*

MEIRELLES de MIRANDA, ROBERTO. (Inst. Zootecnia, Rio de Janeiro.) Resultados iniciais do trabalho de selecao de Leghorn no Instituto de Zootecnia.

INITIAL RESULTS OF SELECTION WORK WITH LEGHORNS IN THE INSTITUTO DE ZOOTECNIA. *Publ. Inst. Zootecnia* [Rio de Janeiro] 13. 1-22. 1954 [rec'd. 1956].—A detailed description of a 6-year selection work of Leghorns for high egg production is given and the annual flock average production figures are presented. These averages were: 145.6, 143.5, 165.5, 191.9, 194.8, and 179.4 eggs. Comments are made on variability, mortality, intensity of selection, use of proved sires and repeatability of progeny of the same sires in different years.—Auth. summ. *(Biological Abstracts)*

MERAT, P. 1955. [Sta. Rech. Avicol., Centre Nat. Rech. Zootech., Jouy-en-Josas, Seine-et-Oise.] La race Gâtinaise. Étude de sa variabilité génétique en vue d'obtenir des croisements homogènes.

THE GATINAIS BREED. A STUDY OF ITS GENETIC VARIABILITY IN ORDER TO PRODUCE TRUE BREEDING CROSSES. *Ann. zootech.* [*Paris*], 4: 259-283.—At Jouy there are 3 flocks of Gâtinais fowl, which were originally obtained from different regions; breeding experiments were carried out to ascertain the genotype. In 1953, Gâtinais ♂♂ were crossed with Sussex ♀♀, and Gâtinais ♀♀, with (Marans ♂ × Sussex ♀) ♂♂. In 1954-55, F_1 and F_2 from Gâtinais ♀ × R.I.R. ♂ matings were used. In addition to recessive white *(c)*, which was carried by all, there was a considerable frequency of dominant white (I), and allele e^+ of the "extension of black" series, "blue" *(G)*, sex-linked barring (B), as well as the corresponding alleles *i,e,g,b*. Sex-linked golden (*s*) and the recessive for yellow feet (*w*) are rare. Neither extended black nor sex-linked rapid feathering (*k*) was observed. Individual phenotypes included golden in the presence of recessive white, brown or "salmon" pigmentation, "retarded colouration" of plumage, and, in the F_2, bluish-grey feet. Further work is needed to analyse some of these characters. *(Animal Breeding Abstracts)*

MERRITT, E. S., and **R. S. GOWE.** (Canada Dept. Agric., Ottawa.)

ENVIRONMENT AND POULTRY BREEDING PROBLEMS. III. THE PERFORMANCE OF 8 CROSSBRED AND 2 PUREBRED BROILER STRAINS AT 3 LOCATIONS. *Canadian Jour. Agric. Sci. 36(1):* 72-80. 1956.—Eight crossbred and 2 purebred "strains" of broilers, representing 8 commercial breeders and 2 experimental crosses, were raised at 3 farms, under a uniform diet and management routine. Body measurements taken included 6-week body weight (at 2 locations) and body weight, breast angle, keel length and shank length at 10 weeks of age at all 3 locations. A sample of 60 birds of each "strain," with equal numbers of each sex, at each location was taken for securing body measurements, comprising a total of 1800 birds. Analysis of variance of data, within sexes, showed a "strain" x location interaction for 6-week body weight in males and for breast angle for females at the P 0.05 level of significance. There was no other evidence of any important interactions between "strain" and location for traits studied. Location effects were statistically significant at the P 0.01 level of significance for all traits studied with the exception of 6-week body weights. Strain effects for all traits measured at 10 weeks accounted for about 14% and location effects for 10% of the variance, despite the fact that the rations and management procedures were standardized at all locations. Under the conditions of this experiment, it was concluded that interactions between heredity and environment for the traits studied were of a low magnitude and thus relatively unimportant. —E. S. Merritt. *(Biological Abstracts)*

ONISHI, N., TAKETOMI, M., KATO, Y., and **MIYAZONO, Y.** 1955. ON THE INHERITANCE OF THE SURPLUS PRIMARIES IN THE FOWL. *Bull. nat. Inst. agric. Sci.* [*Chiba*], *G*, No. 11: 33-38. —The mode of inheritance of primary feather number was studied in crosses between Nagoya fowls with more than the normal number of 10 primaries on each wing and White Leghorns with the normal number of primaries. The results indicate that the occurrence of extra primaries is due to the complementary action of 2 completely dominant autosomal genes, *Sf*$_1$ and *Sf*$_2$. The condition occurs very rarely in White Leghorns and Japanese Game (Mikawa and Shamo breeds), but is fairly common in Barred Plymouth Rocks, R.I.R.s and Nagoyas. No relationship was found between the number of primaries and economic characters such as growth and egg production.—Abstract of English summary. *(Animal Breeding Abstracts)*

OREL, V., F. MUSIL and **V. ZNOJILOVA.** (Forschungsanstalt für Milch und Eier, Brno, Czechoslovakia) Uber die Selection der Legehennen nach Eierqualitat und ihren Einfluss auf die Eierproduktivitat sowie uber Korrelation zwischen den einzelnen technologischen Eiereigenschaften. *Archiv für Geflügelkunde* XX: 271: 281, 1956.

THE INFLUENCE OF SELECTION WITH RESPECT TO EGG QUALITY ON TOTAL EGG PRODUCTION (number and weight of eggs) has been studied. In addition to this the correlation between sexual maturity of laying hens and technological egg properties has been determined.

The eggs being analyzed were taken from 40 laying hens of the following strains: White Leghorn, Rhode Island Reds, Brown Leghorn, White Wyandottes. The egg properties of the individual hens were determined by analyzing 5-20 eggs at every time.

No significant correlation has been found between annual egg production, sexual maturity and the protein index ($r = -0.07$, $r = -0.016$). Even during the various seasons the existing correlation was not statistically significant.

A weak negative correlation, being statistically not significant, has been observed between the specific weight of newly laid eggs and egg production ($r = -0.23$). Sexual maturity did not influence the specific egg weight ($r = -0.02$).

For individual eggs (about 1000) the correlation between egg weight and protein index ($r = -0.002$), egg weight and specific weight ($r = +0.110^{**}$), egg weight and loss of water ($r = -0.118^{**}$) has been determined.

For the determination of the interrelations of the various egg properties, following correlations of the various egg properties were observed: Protein index—loss of water ($r = -0.13^{**}$); specific weight—loss of water ($r = -0.22_{++}$); specific weight—thickness of egg shell ($r = +0.65^{**}$); loss of water—thickness of egg-shell ($r = -0.21^{**}$); loss of water—egg-shell formation at x-ray examination ($r = -0.014$); loss of water—surface formation ($r = +0.81^{**}$).

Porosity and permeability of egg-shells cannot be determined sufficiently by the method of Weston & Halnan (1927). There does not exist a correlation between the spottiness of egg-shells, being observed at x-ray examination, and the permeability of egg-shells. A significant positive correlation existed between loss of water and malformation of egg-shells ($r = -0.81^{**}$). Hence it follows that water evaporates quickly in eggs with a rough deformed shell.

The strong significant correlation ($r = +0.56^{**}$) between the height of the air chamber and the loss of water in eggs is of practical value for the determination of the degree of desiccation in eggs by taking into consideration the height of the air chambers of various eggs.

One can conclude from the results that egg production is not unfavorably influenced (number and weight of eggs) by selecting laying hens with respect to technological egg quality.

The various egg properties are correla'ed. Thus a selection with respect to one property can possibly have a favorable influence on the others. (Authors)

OREL, V. and **F. MUSIL,** and **V. ZNOJILOVA.** (Forschungsantalt für Milch und Eier, Brno, Czechoslovakia)

TECHNOLOGICAL QUALITIES OF EGGS FROM THE VIEW POINT OF BREEDING (Technologicke vlastnosti vajec s hlediska plemenarskeho). *Sbornik Ceskoslovenske Akademie Zemedelskych Ved,* 29; 6: 443-458, 1956.—Measurements on eggs from hens of 5 lines (4 breeds), laid during the year 1955, were taken on egg white index, shell thickness, specific gravity of fresh laid eggs, porosity of the shell and loss of weight after storing the eggs for 10 days at 25° C.

Highly significant differences in all these characteristics were determined between breeds, lines and particularly between individual hens.

The lowest albumen index of an egg was 22 and the lowest average value for a hen 43. The highest albumen index of an egg was 144 and the highest average value of a hen 111. From this point of view best eggs came from Brown Leghorn with an average value 86, whereas White Wyandottes showed the lowest albumen index on an average value of 54.

The best shell thickness showed the eggs from White Leghorn hens with an average value of 0.37 mm and of specific gravity 1.083, whereas white Wyandottes had the eggs with a thickness of a shell 0.33 mm and of specific gravity 1.075.

The greatest loss of weight had the eggs from Brown Leghorn with an average value of 3.51% and the lowest value on average the eggs from Rhode Island hens of an average value 2.99%.

The porosity showed to be quite independent upon the loss of weight. The greatest porosity had the eggs from Rhode Island hens, whereas these eggs had the lowest loss of weight.

Repeatability of estimates for these eggs characteristics have been determined for albumen inlex 0.59, for shell thickness 0.42, for specific gravity 0.33, for porosity 0.20 and for loss of weight 0.26.

A satisfactory measure for a hen of the inherent albumen quality may be obtained by analyzing 5-10 eggs and for the strength of shell by determining the specific gravity of fresh laid eggs of 10-15 eggs and for loss of weight at least of 15 eggs. (Authors)

VAN BRINK, J. M., and **UBBELS, G. A.** 1956. [Inst. Genet., Univ. Utrech *a*] La question des hétérochromosomes chez les Sauropsidés. Oiseaux.

THE QUESTION OF HETEROCHROMOSOMES IN THE SAUROPSIDA. BIRDS. *Experientia,* 12: 162-162.—The diploid number of chromosomes in the embryonic spleen and gonads of the domestic fowl *(Gallus domesticus)* was normally about 78 (67-82), not more than 10 or 11 pairs of chromosomes being non-punctiform. A detailed count was difficult, owing to the extremely small size of the microchromosomes (less than 0.5μ). The 5th largest pair in the ♂ (represented by a single element in the ♀) was identified as the sex chromosome pair. It was not possible to decide whether the sex mechanism is of the Z-O or the Z-W type. *(Animal Breeding Abstracts)*

PHYSIOLOGY

ADAMS, JOHN L. (U. Wisconsin, Madison.)

A COMPARISON OF DIFFERENT METHODS OF PROGESTERONE ADMINISTRATION TO THE FOWL IN AFFECTING EGG PRODUCTION AND MOLT. *Poultry Sci 35(2):* 323-326. 1956. Six groups of 10 yearling Single Comb White Leghorn hens were dyed with blue ink and placed in a laying battery. One group was a control and the other 5 groups were treated with progesterone as

follows: in feed at the rate of 110 mg/g or 220 mg/kg of feed; a single intramuscular injection of 50 mg; pellets of pure progesterone varying in size from 28.8 to 51 mg (average 33.4) implanted subcutaneously in neck; weekly injection of 25 mg/week. Data on egg production, body weight, and rate of molt were recorded for 12 weeks. Although body weight was not affected ,all treatments depressed egg production. All treatments except the pellet and single injection were effective in increasing the rate of molt of the primary wing feathers. The weekly injection of 25 mg of progesterone was significantly more effective than any other treatment in inducing wing molt. Oral administration of progesterone was slower to take effect than the injection methods. Injection of progesterone in propylene glycol was quicker to act but not as long-standing as subcutaneous implantation of pure progesterone pellets.—J. L. Adams. *(Biological Abstracts)*

BALDISSERA NORDIO, C. 1955. [Ist. Zootec. Gen., Univ. Milan.] Influenza della somministrazione di progesterone alle galline ovaiole sulla produzione delle uova.

EFFECT OF PROGESTERONE TREATMENT ON EGG PRODUCTION IN HENS. *Atti Soc. ital. Sci. vet.*, 1954, 8: 310-311. Discussion: 311-312.—The egg production of 15 White Leghorns was at first arrested, and then considerably reduced, during 1 mnth. in which they received doses totalling 15 or 90 mg. progesterone in oil. During 8 mnths. following treatment production was slightly higher than that of controls. *(Animal Breeding Abstracts)*

BOLTON, W. (Poultry Res. Centre, West Mains Road, Edinburgh 9.)

THE EFFECT OF INJECTIONS OF OESTRADIOL DIPROPIONATE INTO IMMATURE PULLETS UPON THE MANGANESE CONTENT OF THE BLOOD PLASMA AND OF SOME TISSUES. *Brit. Jour. Nutrition 9(2):* 170-173. 1955.—Twelve pullets, 11 weeks old, were injected intramuscularly with estradiol dipropionate in peanut oil. Six received 1 mg estradiol dipropionate on each of the first 11 days; the remainder received doses derived from the formula dose $= 1 \pm \log_{10} x$ where x varied between 1 and 10. Overall effects on growth and organ weights indicated a trend toward superior results from administration of the hormone in increasing doses. Plasma Mn concentrations were considerably higher in estrogen-treated birds (13.8, 34.9 μg/100 ml) than in control laying hens (6.35 μg/100 ml). Liver Mn concentrations (77.3, 78.3 μg) for the estrogen-treated birds lay between those observed in non-laying hens (58.4 μg) and laying hens (89.3 μg).—J. E. Oldfield. *(Biological Abstracts)*

BRENEMAN, W. R. (Indiana U., Bloomington.)

STEROID HORMONES AND THE DEVELOPMENT OF THE REPRODUCTIVE SYSTEM IN THE PULLET. *Endocrinology 58(2):* 262-271. 1956.—White Leghorn pullets received testosterone propionate (TP) and estradiol dipropionate (ED) alone and in combination from the 20th to the 39th day post-hatching. The 5.0 μg and 25.0 μg daily dosages of the androgen increased comb weights 100% and 700%, respectively, but when injected simultaneously with the estrogen the effectiveness of the TP was decreased about 25%. TP had no significant effect on oviduct weight when given separately at any of the 3 dosages whereas 25.0 μg daily of ED increased oviduct weight 600%. When the highest dosages of the two sexogens were given together, oviduct growth was augmented; an increase of about 1400% occurred. Ovarian and pituitary weights were not affected by hormone treatments and pituitary gonadotropin content was essentially normal except in the series which received 25.0 μg daily of the two sexogens. The amount of gonadotropin was markedly decreased in this series. Administration of progesterone, anhydroxyprogesterone, pregnenolone, dehydroisoandrosterone, and Reichstein's Substance S acetate at dosage levels of 5.0 μg and 25.0 μg daily, alone and in combination with 25.0 μg of ED did not produce an augmentation of oviduct growth.

Furthermore, these steroids had greater inhibitory effects than did the TP treatments. Comb and ovarian weights were slightly lower than normal and the pituitary content of gonadotropin was markedly decreased. Progesterone was given at dosages of 100 μg, 250 μg, and 500 μg daily and the 500 μg also was injected with 25.0 μg of ED. Progesterone had only slight effects on comb, ovary, and pituitary weights or pituitary potency when given alone. When progesterone was injected in combination with ED, however, comb and ovarian growth were markedly inhibited and pituitary secretion of gonadotropin was almost completely suppressed. Oviduct growth was greatly stimulated in this series and was about 4200% greater than in the control. An androgen comparable to testerone may be present in the female bird at sexual maturity and this hormone acting in concert with an estrogen may be necessary for the normal development of the avian reproductive system. The 5 other steroids tested, including progesterone, appear to play no major role in the maturation of the reproductive system of the female bird.—Auth. summ. *(Biological Abstracts)*

CHAMPION, LLOYD R. (Michigan State U., East Lansing.)
PERFORMANCE OF TWO STRAINS OF S. C. WHITE LEGHORNS UNDER CONDITIONS OF RELAXED SELECTION. *Michigan State Univ. Agric. Expt. Sta. Quart. Bull. 38(3):* 353-361. 1956. —The performance of an "introduced" and a "native" strain of S. C. W. Leghorns under Michigan environmental conditions in the absence of selection pressure for 3 generations was tested. Characteristics measured were: average age of sexual maturity, body weight at 20 weeks of age, mean egg production for 90 consecutive days, hen-housed mortality for 365 days, average egg weight and hatchability. No set pattern of fluctuation for the variables studied was found in the particular strains of birds tested and under the conditions outlined. The individuals in generations subsequent to the first generation individuals performed as satisfactorily for the economically important traits as did the original stocks. Further, the progeny from introduced birds, the parential stocks of which were acclimated to certain environmental conditions, did not perform adversely under southern Michigan environmental conditions.—L. R. Champion. *(Biological Abstracts)*

CRETSCHMAR, M. 1954. Versuche zur hormonalen Geschlechtsumstimmung bei Hühnern.
EXPERIMENTS ON HORMONAL SEX REVERSAL IN THE DOMESTIC FOWL. *Celler JB.*, 1953: 55-70. *(Kleintierz. Forsch. Lehre,* 2.)—The object of the experiments was to determine whether it is possible by means of oestrogen injections to change "uneconomic" cockerels into laying hens. Amounts of Foragynol ranging from 10 to 1000 I.U. were injected into eggs containing autosexing Leghorn or Legbar embryos whose genetic sex was easily identifiable. In some cases further hormone treatment was given later. The effects of the various dosages on the genitalia of chicks and of older birds are described. Many ♂♂ showed very considerable changes towards the ♀ type in plumage and genital development, but no functional ovaries were found among the treated ♂♂. The oviducts of the genetic ♂♂ showed pathological symptoms which in some cases led to the death of the bird. The oviducts of ♀♀ receiving supplementary oestrogen also tended to be abnormal. *(Animal Breeding Abstracts)*

ELJBERT, G. K. 1956. [Gorodets Poult. Breed. Sta., Gorki Province.] Mestnye gorjkovskie gusi.
INDIGENOUS GORKI GEESE. *Ptitcevodstvo,* 6 (3) : 20-22.—Large numbers of geese are bred in the Gorki Province, especially on the banks of tributaries of the Volga. The light indigenous type is known as the "dry-land" goose; ganders average 5.5 kg. adult live weight. Seven av. body measurements of ♂♂ and ♀♀ are tabulated.

Day-old goslings of this type are distinguished by a long wide beak bearing a knob. Production averages 55 (40-98) eggs weighing 135-160 g. each. The ♀♀ come into lay at the end of March and reach maximum production in April-May; when artificial lighting is supplied, the birds come into lay in Dec.-Jan. Hatchability averages 61·6% of the eggs set.

Geese of the heavy "swimming" type fatten well and produce good quality meat and fat. They yield more and better feathers and down than the light type. Although ♀♀ come into lay earlier, they are later in reaching sexual maturity; egg production is low (8-18 per year) and a lower percentage is fertile.

The 3rd indigenous type consists of crossbreds from the other 2 types. They resemble the heavy type, but mature later. Their production averages 35-65 eggs of 180 g. each. The young grow more quickly than those of the light type. *(Animal Breeding Abstracts)*

ERASMUS, JAN

RELATIONSHIP BETWEEN AGE AND BODY WEIGHT IN POULTRY. Farming in South Africa 31 : 360 : 215-216, 218 (1956). —The importance is emphasized between chick and adult body weight. The correlation coefficient is given between body weight and age in chicks and white Leghorn hens. The results reveal a relationship between body weight at two weeks of age and adult body weight. The analysis also showed the greatest variation at 2 weeks of age with a diminishing variation as the birds became older.

GUHL, A. M. 1956.

THE SOCIAL ORDER OF CHICKENS. *Sci. Amer.*, 194 (2) : 42-46. 1346—At the Zoological Laboratory, Kansas State College, it has been shown that low-ranking pullets take longer to reach sexual maturity than those of privileged status. Birds in a socially unstable flock eat less and have a lower growth rate than birds in a stable flock. Capons raised in a flock of pullets sometimes fall to an intermediate rank in the peck order. Hens below the capons in the peck order mate readily with them but their advances are repelled by hens which outrank them. In all-male flocks of young birds the low-ranking ♂♂ are often the object of aberrant treadings by ♂♂ of higher rank. Similarly, in flocks of hens, dominant ♀♀ may tread hens lower in the peck order, although they respond normally to the advances of a ♂ in the same flock. Males at the top of the peck order are more successful in mating with hens than are low-ranking ♂♂ and sire a greater number of offspring. The lowest-ranking ♂♂ are sometimes completely repressed sexually. The higher hens stand on the social scale, the less likely they are to mate. Male sexuality is not necessarily related to aggressiveness or to standing in the peck order, hence a dominant ♂ with a low sex drive may reduce the fertility of a flock of hens by preventing other ♂♂ from mating. *(Animal Breeding Abstracts)*

HAFEZ, E. S. E., and **G. A. R. Kamar.** (Fac. Agric., Cairo.)

DEVELOPMENTAL CHANGES IN THE REPRODUCTION ORGANS OF THE DOMESTIC FOWL. *Poultry Sci. 34(5):* 1002-1010. Illus. 1955.—Fayomi birds (18) of age groups (5, 6, 7, 9, 12 and 27 months) were dissected. The ovary, oviduct, dressed carcass and body weight and body fat were weighed. The number and diameter of visible oocytes and the length of oviduct were measured. At 5 months old, the ovary weight, oviduct weight and oviduct length were 1.4 g, 1.6 g, and 12.8 cm respectively. At sexual maturity, there was a rapid increase and the corresponding figures were 25.7 g, 28.4 g and 49.1 cm respectively. After sexual maturity there was a drop at 9 months. The oviduct was divided into pigmented and non-pigmented portions. The ratio of pigmented to non-pigmented was high before sexual maturity. The ovary weight to the oviduct weight was almost constant irrespective of age and reproductive phase. At 5 months, the

total number of visible oocytes was 680 and at sexual maturity 1120. At sexual maturity, the dressed carcass was 532 g and the body weight was 1017 g. The percentage of ovary weight to body weight was 0.17 before sexual maturity and 2.5 at sexual maturity; it did not vary afterward. At the one age, the measurements of reproductive organs differed according to reproductive phase.—G. A. R. Kamar. *(Biological Abstracts)*

HOSODA, TATSUO, TADATSUNE KANEKO, KAZUSHIGE MOGI, and **TSUNEO ABE.** (Natl. Inst. Agric. Scis., Chiba-Shi, Japan.)
FORCED OVULATION IN GONADOTROPHIN-TREATED FASTING HENS. *Proc. Soc. Exptl. Biol. and Med. 92(2):* 360-362. Illus. 1956.—White Leghorn hens laying at the onset of the experiments were starved for 7-9 days, during which time the birds received daily instramuscular injections of one of several gonadotropins. Such hens rarely ovulated after the 2d day of treatment. However, ovulation in fasting hens so treated for 7-8 days was induced by a single intravenous injection of a luteinizing hormone (LH) preparation. One tenth mg of the LH preparation used was close to the minimally effective dosage. About 8 hours elapsed between LH injection and follicular rupture. It was not possible to induce ovulation of immature follicles (about ca. 2 cm in diameter) by intravenous injection of as much as 2 mg of the LH preparation.—T. Hosoda. *(Biological Abstracts)*

HUBLE, JAN. (State U. Ghent, Belgium.)
HAEMATOLOGICAL CHANGES IN COCKERELS AFTER ACTH AND CORTISONE-ACETATE TREATMENT *Poultry Sci. 34(6):* 1357-1359. 1955.—Giving ACTH (4.I.U./day/100 g) or cortisone-acetate (5 mg/day/100 g) to pure bred Rhode Island Red cockerels, 2-4 weeks old, resulted in marked changes in the white blood picture, with no changes in number of erythrocytes. Both treatments produced a relative lymphopenia, a relative and absolute rise in heterophils and a relative and absolute eosinopenia. No change was seen in the absolute number of lymphocytes.—Jan Hublé. *(Biological Abstracts)*

KAUFMAN, L. 1954. [Inst. Gen. Anim. Breed., Marie Curie-Sklodowska Univ., Lublin.] Prʊby zmieniania płci u kogutʊw w stadium zarodka.
EXPERIMENTS ON SEX MODIFICATION IN COCKS DURING THEIR EMBRYONIC DEVELOPMENT. *Ann. Univ. M. Curie-Sklodowska, E,* 9: 25-40.—The introduction of 1.5 mg. of a synthetic oestrogen, Rutoestrol, into the air chamber of 40 eggs after 24 or 43 hrs. of incubation caused the development of 2 oviducts (the right incomplete) in pullets from the treated eggs and the development of oviducts and the flattening of one (the left) or of both testes in treated ♂♂. The oviducts were thin-walled in young ♂♂ and were filled with serous fluid in older cockerels. A histological study of the testis revealed gradual atrophy of the seminiferous tubules and hypertrophy of the interstitial tissue. In some cases the lumen of the oviduct was filled with tumorous tissue. No spermatozoa were present. All birds from the treated eggs had the body conformation of hens. Although their plumage was of the ♂ type, the cockerels did not crow and showed no sex instinct. The rate of growth was greater in ♂♂ than in ♀♀.—Abstract of English summary. *(Animal Breeding Abstracts)*

LESHER, S. (Biol. and Med. Res. Div., Argonne Natl. Lab., Box 299, Lemont, Ill.) **GEORGE E. COTTRAL,** and **NELSON F. WATERS.**
THE EFFECT OF LOW DOSAGE X-RAY IRRADIATION ON REPRODUCTION IN CHICKENS. *Poultry Sci. 34(5):* 1089-1092. 1955—X-ray radiation was given to chickens of various ages and at various dosages to determine effects on reproduction. No significant difference in egg production, fertility or hatchability occurred between irradiated

and non-irradiated chickens. If any damage occurred to the ovaries at dosage levels ranging from 50 to 300 roentgen at the rate of 5 roentgen/minute the damage was not serious and recovery was complete.—N. F. Waters. *(Biological Abstracts)*

McCARTNEY, MORLEY G. (Pennsylvania State U., University Park.) RELATION BETWEEN SEMEN QUALITY AND FERTILIZING ABILITY OF WHITE HOLLAND TURKEYS. *Poultry Sci. 35(1):* 137-141. 1956.—Semen samples were collected from males twice during the breeding season and evaluated for quality by 5 laboratory tests. The fertilizing ability of each male was estimated by mating a number of females with a single insemination of undiluted semen and determining duration of fertility and percentage fertility. There were no differences among males for semen volume, percentage progressive motility, pH, sperm concentration or fertilizing ability. Amounts of semen and sperm concentration per ejaculate were greater during the second collection period. None of the laboratory tests were correlated with either duration of fertility or percentage fertility.—M. G. McCartney. *(Biological Abstracts)*

MELLEN, W. J., and **F. W. HILL.** (Cornell U., Ithaca, N. Y.) STUDIES OF THE AVIAN RESPIRATORY QUOTIENT. *Poultry Sci. 34(5):* 1085-1089. 1955.—The total RQ was measured by the Haldane gravimetric method in chickens of various ages and strains. When determinations were made singly rather than in groups, approximately 50% of RQs were below 0.70 in birds fasted 20 hours or more. In an experiment with males 2.5-7.5 weeks of age, there was no significant change in RQ with increasing age or with increased fasting time from 24 to 54 hours. Fasting RQs in mature pullets ranged from 0.64 to 0.74, and were not changed materially by ingestion of fat or protein. —W. J. Mellen. *(Biological Abstracts)*

MORENG, ROBERT E. and **REECE L. BRYANT.** (North Dakota Agric. Expt. Sta. Fargo.) THE TOLERANCE OF THE CHICKEN EMBRYO TO PERIODS OF LOW TEMPERATURE EXPOSURE. *Poultry Sci. 34(6):* 1342-1348. 1955.—A study on effects of cooling rate and duration of exposure on the developing S. C. White Leghorn and New Hampshire chicken embryos was investigated. Mortality and hatchability of the embryos were used as a measure of treatment effect. Internal temperature of eggs exposed to -10°F and 32°F environment for various lengths of time was recorded by means of a Brown Dynamaster recording potentiometer. Copperconstantan thermocouples were placed at a depth of 1 inch from the shell, at the large end of the egg and in the vicinity of the embryo in sample eggs only. When internal temperature of the egg was maintained at approximately 32°F a limited number of the embryos withstood total exposures up to 76 hours at 1 day of age. Cooling rates of the eggs exerted a marked influence on ability of the embryo to withstand low temperature. The slower cooling rate appeared to be the least damaging of the 2 rates studies. Effects of rate of cooling were independent of the total exposure to a specific internal temperature. No detrimental effects were noted when eggs were treated prior to incubation to above freezing temperatures. It is believed that elimination of ice crystal formation by holding eggs slightly above the freezing point is highly influential in increasing their resistance to cold exposure.—R. E. Moreng. *(Biological Abstracts)*

MORENG, ROBERT E., and **REECE L. BRYANT.** (North Dakota Agric. Expt. St., Fargo.) REPRODUCTION IN TURKEYS AS INFLUENCED BY 4-NITROPHENYLARSONIC ACID. *Poultry Sci. 35(2):* 406-409. 1946. —Effects of 4-nitrophenylarsonic acid on the reproduction abilities of turkey breeder hens were studied. The drug had a depressing effect

on egg production and on the size of poults at hatching time. It had no effect on the fertility or hatchability of the eggs nor on the livability of the poults produced.—R. L. Bryant. *(Biological Abstracts)*

MORENG, ROBERT E., I. A. SCHIPPER, and **REECE L. BRYANT.** (North Dakota Agric. Expt. Sta. Fargo.)

PARTIAL DUPLICATION OF ORGANS IN CHICKENS. *Poultry Sci., 35(2): 308-311. Illus. 1956*—A detailed report of duplicate organs observed in a S. C. White Leghorn hen was made with accompanying illustrations. This bird had 2 vents, one to the left and the other to the right of the longitudinal median plane of the body. There were also 2 cloaca and oil glands. The cloaca were joined but only the left cloaca opened into the true vagina of the left functional oviduct. No evidence of duplication was seen in any other portions of the body. Additional observations of duplications in a 2d chicken and a turkey are reported. An attempt was made to include published and unpublished observations by other investigators and to discuss some of the possible explanations for the occurrence of duplication or organs.—*R. E. Moreng.* (Biological Abstracts)

ONISHI N., Y. KATO and **K. FUTAMURA.** 1955

STUDIES ON THE ARTIFICIAL INSEMINATION OF DUCKS. *Bull. nat. Inst. agric. Sci.* [*Chiba*], *G, No. 11:* 1-16.—Three methods for the manual induction of ejaculation in drakes are described and illustrated. The method of inseminating the duck is also described. The amount of semen per manually-induced ejaculate varied from 0.1 to 1.0 cm.^{3} (av. 0.32 cm.^{3}); *p*H was 6.6-7.8 (av. 7.31), number of spermatozoa per cm.^{3} 7-3587 million (av. 905 million), and period of survival at 5±2° C., 24-168 hrs. (av. 88 hrs.). It is recommended that drakes from which semen is to be collected should be isolated from the ducks, and that collections should be made twice daily. To obtain best results, the ducks should be inseminated at least every 5 days.—*From English summary.* (Animal Breeding Abstracts)

SHIRLEY, H. V. Jr., and **A. V. NALBANDOV.** (U. Illinois, Urbana.)

EFFECTS OF TRANSECTING HYPOPHYSEAL STALKS IN LAYING HENS. *Endocrinology 58(6):* 694-700. Illus. 1956—Complete transection of the hypophyseal stalk in laying hens, caused an immediate and unregained loss of body weight, complete atrophy of the ovary, oviduct and comb, thus producing a condition closely resembling hypophysectomy as far as gonadal function is concerned. Stalk section did not significantly alter secretion of either thyrotropic or adrenotropic hormones as judged by the normal histology and weight of their target glands, the molting pattern of hens or their ability to withstand sudden temperature changes and prolonged nocturnal fasts. All of these are drastically and negatively affected by hypophysectomy. For these reasons the data presented are thought to support the theory that the rate of secretion and release of the gonadotropic complex in birds is governed by a hypothalamic neurohumor via the portal system. It seems unlikely that the partial hypofunction of the pituitary gland after stalk transsection is due to ischemia. The latter should result in panhypopituitarism rather than in the decreased flow of only gonadotropic complex.—*Authors.* (Biological Abstracts)

SKALSKA-SURDACKA, K. 1954 [Inst. Gen. Anim. Breed., Marie Curie-Sklodowska Univ., Lublin.] Wplyw pory wylegu na dojrzewanie, tempo niesnosci i niesnosc zimowa u zielononozek kuropatwianych i rhodeislandow.

THE INFLUENCE OF THE HATCHING TIME UPON MATURITY, EGG-LAYING RATE AND WINTER EGG PRODUCTION IN POLISH GREENLEGS AND RHODE ISLAND REDS. *Ann. Univ. M. Curie-Sklodowska, E 9:* 209-228.—A study was made of the effect of date of hatching upon age at sexual maturity, laying rate and winter egg production in 440 Polish Greenleg and 511 R.I.R. hens reared under

the same conditions. The former were hatched between 25th Feb. and 16th May, the latter between 1st Jan. and 22nd of April.

In the Polish Greenlegs there was a distinct positive correlation between hatching date and age at maturity in only 1 yr. out of the 3 investigated. In the R.I.R.'s there was a positive correlation in all 3 yrs. A positive correlation between hatching period and rate of winter laying occurred in 2 yrs. in the Greenleg (in 1 yr. it could not be ascertained) and in all 3 yrs. in the R.I.R. The av. number of days to maturity over the 3-yr. period was 209.3-227 days in the Polish Greenleg *v.* 200.7-226 days in the R.I.R. The mean rate of lay during the test period was 39.3-44.1% in Greenlegs and 48.7-53.8% in the R.I.R.'s depending on the hatching date. Winter egg production averaged 32.2-62.8 eggs in the Polish Greenleg and 53.8-87.3 eggs in the R.I.R. It was strictly dependent on hatching date. In the Polish Greenleg the highest av. winter production (43.4 eggs) was from pullets hatched between 17th March and 29th April. In the R.I.R. the highest winter production (62.4 eggs) was from pullets hatched between 10th March and 2nd April.—Abstract of English summary. (Animal Breeding Abstracts)

TANAKA, T., and M. M. ROSENBERG. (U. Hawaii, Honolulu.)
EFFECTS OF TESTOSTERONE AND DIENESTOL DIACETATE ON HEMOGLOBIN LEVELS OF COCKERELS AND CAPONS. *Poultry Sci. 34(6):* 1429-1437. 1955—Two experiments were conducted to determine the effects of testosterone and dienestrol diacetate on hemoglobin levels of young New Hampshire capons and normal cockerels. Capons were randomized into 3 lots according to body weight. Normal cockerels were similarly randomized to serve as controls. For 8 weeks, the following rations were fed to the 3 respective capon and cockerel lots in trial 1: the control ration; one containing 909.0 mg of testosterone per 100 lb. of mash; and another containing 310.5 mg dienestrol diacetate. Following this 8-week period, "hormone" rations were reciprocally exchanged and continued for 8 more weeks. In trial 2, concentrations of testosterone and dienestrol diacetate were doubled and the initial phase of the test period extended to 10 weeks. Hemoglobin assays were obtained at weekly intervals from each individual. Testosterone significantly raised the hemoglobin levels of capons, while the lower readings obtained from capons fed dienestrol diacetate were not significantly different from the controls. Although cockerels receiving testosterone had higher hemoglobin levels and the lot fed dienestrol diacetate had lower levels than those fed the control ration during the 1st half of these trials, differences were not statistically significant. After experimental rations were interchanged, the capons fed testosterone showed a great increase in hemoglobin levels within 1 week and they had higher levels than other lots after 3 weeks. The reciprocated capons receiving dienestrol diacetate did not show a rapid decline, but following 4 weeks on this ration, hemoglobin levels did drop to approximately those of capon controls. Normal cockerels did not respond to the reversed treatments.—*T. Tanaka.* (Biological Abstracts)

van TIENHOVEN, A., H. C. THOMAS, and L. J. DREESEN. (Mississippi State Coll., State Coll.)
THE EFFECT OF SULFAMETHAZINE FEEDING ON THE THYROIDS, COMBS AND TESTES OF SINGLE COMB WHITE LEGHORN COCKERELS. *Poultry Sci. 35(1):* 179-191. 1956.—Sulfamethazine feeding at levels of 0.1% and 0.2% to White Leghorn cockerels from 1 day to 16 weeks resulted in precocious spermatogenesis, larger combs and increased thyroid weights. Radioactive iodine (I^{131}) uptake by the thyroids was increased due to sulfamethazine feeding. With advancing age I^{131} uptake by the thyroid decreased in a logarithmic manner in sulfamethazine fed birds and in controls. Pituitary bioassays did not show a consistent effect of sulfamethazine feeding on gonadotropic potency. The hypothesis is made that the sulfamethazine effect on the testes involves the thyroid.*A. van Tienhoven. (Biological* Abstracts)

TOMHAVE, A. E. (U. Delaware, Newark.)
INFLUENCE OF AGE OF NEW HAMPSHIRE FEMALE BREEDERS UPON HATCHABILITY OF EGGS. *Poultry Sci. 35(1):* 236-237. 1956.—The hatchability of eggs 127, 232 and 329 days after start of production was studied. Average hatchability of either fertile or total eggs decreased as breeders age increased.—*A. E. Tomhave.* (Biological Abstracts)

NUTRITION

ACKERSON, C. W., and **F. E. MUSSEHL.** (U. Nebraska, Lincoln.)
GROWTH OF CHICKS AS INFLUENCED BY DEGREE OF CONFINEMENT AND LEVEL OF FEED INTAKE. *Poultry Sci. 35(2):* 483-485. 1956.—Day-old-chicks were fed in individual cages and in batteries at 4 levels of intake to note differences in growth due to such restriction. Chicks fed in the individual cages each had 900 g of feed; those in the batteries had an average of 900 g each. The standard error of the mean weight of chicks fed individually was but 40% of that of chicks fed by lot in batteries. This indicates that smaller significant differences can be detected by the individual feeding procedures. Extending the feeding time by 6 days by restricting the intake did not change the mean weight of the lots fed the same ration.—Auth. summ. (Biological Abstracts)

AMES, STANLEY R. (Eastman Kodak Co., Rochester, N. Y.)
ROLE OF VITAMIN E (ALPHA-TOCOPHEROL) IN POULTRY NUTRITION AND DISEASE. A REVIEW OF RECENT LITERATURE. *Poultry Sci. 35(1):* 145-159. Illus. 1956—A comprehensive review including color plates of deficiency disease symptoms and an extensive summary of alpha-tocopherol in feedstuffs. Calculations indicated that the content of alpha-tocopherol in a typical poultry feed is only borderline with respect to estimated requirements.—*S. R. Ames.* (Biological Abstracts)

ARSCOTT, G. H. (Oregon State Coll., Corvallis.)
COMPLEXITY OF A CHICK GROWTH RESPONSE TO EGG YOLK, ANIMAL FAT AND FISH SOLUBLES ADDITIONS TO THE DIET. *Poultry Sci. 35(2):* 338-342. 1956—Results were obtained showing the presence of unidentified growth factor activity in dried egg yolk, animal fat and fish solubles supplements when added to a sucrose-soybean meal-type ration and fed to N. H. male X Del. female crossbred male chicks. Relative gains of about 16% were obtained with 4% animal fat and 15% from 4% fish solubles that plateaued when supplements were fed at the 8% level. Where 4, 8 and 12% egg yolk was used relative gains of 14, 25 and 34% were obtained. Evidence is obtained indicating that the response to dried egg yolk is due to more than one unidentified growth factor.—*G. H. Arscott.* (Biological Abstracts)

BALLOUN, S. L., G. A. DONOVAN, and **R. E. PHILLIPS.** (Dept. Poultry Husbandry, Iowa State Coll., Ames.)
TRICHLOROETHYLENE - EXTRACTED AND EXPELLER - TYPE MEAT SCRAPS AND TALLOW IN THE DIETS OF YOUNG CHICKENS. *Poultry Sci. 35(1):* 163-167. 1956—In 5 experiments, trichloroethylene-extracted and expeller meat scraps added to corn-soya rations at 5 or 10% improved growth and feed conversion of chickens. Feed conversion was improved, and mortality rate and growth of chickens to 12 weeks were not adversely affected by 20% trichloroethylene-extracted meat scraps. Dietary additions of tallow improved chick growth and feed conversion, the improvement being less marked when the diet contained expeller meat scraps.—*S. L. Balloun.* (Biological Abstracts)

BOLIN, D. W., WM. E. DINUSSON, M. L. BUCHANAN, ROBERT E. MORENG, and **REESE L. BRYANT.** (North Dakota Agric. Expt. Sta., Fargo.)

CHICK GROWTH RESPONSES WITH THE ADDITION OF AMINO TO WHEAT PROTEINS. *Proc. North Dakota Acad. Sci. 9:* 56-58. 1955.—Commercially available feeds are deficient in lysine. (Biological Abstracts)

BUNNELL, R. H. (U. Connecticut), **L. D. MATTERSON, E. P. SINGSEN,** and **H. D. EATON.**

STUDIES ON ENCEPHALOMALACIA IN THE CHICK. 5. THE EFFECT OF FISH OIL AND DIPHENYL-P-PHENYLENEDIAMINE ON THE VITAMIN E METABOLISM OF THE CHICK. *Poultry Sci. 35(2):* 436-451. 1956—The effect of fish oil and diphenpl-p-phenylenediamine (DPPD) on the vitamin E metabolism of "normal" chicks and of chicks hatched from eggs produced by hens on a vitamin E-low diet was determined. Chicks were fed a basal vitamin E-low semi-purified diet or the basal diet with the addition of either 2% A and D oil, 8 IU of vitamin E/lb. of diet, or 0.05% DPPD alone, and in all possible combinations, for a total of 16 lots per replicate. At intervals of 5 days through a period of 25 days, the chicks were weighed and 4 chicks from each lot were sacrificed for blood and liver samples. Tocopherol estimations were made on the plasma and tocopherol and lipid content estimations were made on the liver. An investigation of methods of liver tocopherol estimations demonstrated that molecular distillation was necessary in order to eliminate artifacts which interfered with the tocopherol estimation. Tocopherol stores in the livers of day-old normal chicks were greater than those of day-old vitamin E-dificient chicks, although these values equalized after 10-15 days on the same diets. Addition of vitamin E to the chicks's diet increased the tocopherol levels in blood plasma and liver, but had little effect on the lipid content of the liver. DPPD showed no over-all effect on the liver or plasma tocopherol levels, but the liver tocopherol stores of the vitamin E-deficient chicks were somewhat elevated. DPPD also stimulated growth, particularly of the vitaminE-deficient chicks, increased the lipid content of the liver, and overcame a part of the growth depression which resulted from feeding fish oil. The feeding of fish oil depressed the tocopherol levels of blood plasma and liver, depressed growth, and decreased the lipid content of the liver. DPPD may influence the metabolism of unsaturated fatty acids in such a manner as to increase their catabolism in the liver, thereby resulting in a possible decrease in the degree of unsaturation of the tissue lipids. The estimation of the tocopherol content of the liver appeared to be a good criterion for use in studies of the vitamin E metabolism of the chick.—*R. H. Bunnell.* (Biological Abstracts)

COMBS, G. F. (U. Maryland, College Park.)

TWENTY-FIVE YEARS OF PROGRESS IN STARTING RATIONS. *World's Poultry Sci. Jour. 11(3):* 211-213. 1951.—Eight week average weights from 1930, 1938, 1946 and 1954 broiler rations were 1.49 lb., 1.79 lb., 2.07 lb. and 2.49 lb.—*J. B. Christiansen.* (Biological Abstracts)

CURTIN, L. V. (Buckeye Cellulose Corp., Cincinnati, Ohio.) and **J. T. RAPER.**

FEEDING VALUE OF HYDROLYZED VEGETABLE FATS IN BROILER RATIONS. *Poultry Sci. 35(2):* 273-278. 1956—Feeding tests (5) using straight run broiler type birds showed that hydrolyzed cottonseed fats are efficiently utilized by broilers. Hydrolyzed fats containing 87% or more total fatty acids improved gains and feed utilization to the same extent as did equal levels of animal fat. Three to 4% added fat provided the maximum amount of energy which could be efficiently utilized on a 20% protein ration. Adding 6% fat to a 20% protein ration did not improve feed utilization over rations containing 3-4% added fat. No deleterious effects on growth were noted on the 6% added fat

diet. Gossypol content of the hydrolyzed cottonseed fats ranged from 0.03 to 0.2%. No effects were noted from the gossypol levels fed. Oxygen absorption measurements showed that the hydrolyzed vegetable fats without added antioxidants were more stable than animal fats to which an antioxidant was added.—*J. T. Raper.* (Biological Abstracts)

DANILEVSKY, V. M. Profilaktika i terapiya vitaminnoi nedostatochnosti ptits.

PROPHYLACTICS AND THERAPY OF VITAMIN DEFICIENCY IN BIRDS. *Veterinariia 1955(5):* 77-81, 1955; Referat. Zhur., Biol., 1956, No. 29679. (Translation).—The clinical picture of A- and D-avitaminosis and polyavitaminoses in farm birds is described. As a prophylactic measure in the summer, birds which do not have access to green pastures should be given 10-30 g of freshly mown grass per bird per day, while during the rest of the year vitamin-containing foods should be added to the feed. Particularly valuable breeding layers, breeding cockerels, and young birds should be given egg yolk, which are rich in vitamins (A,D,B_1,B_2 and others). Good therapeutic effects are produced by brewers' yeast (3-5 g doses) and subcutaneous injections of vitamin B_1. (Biological Abstracts)

EBBEL, H., (Ovomaltine Farm, Oberwangen bei Pern, Switzerland):

FURTHER STUDIES ON THE EFFECT OF DIFFERENT GROWTH PROMOTERS IN THE FEED OF A BROILER PLANT. (Weitere Untersuchungen über den Wachstumseffekt verschiedener Wirkstoffe im praktischen Mastbetrieg) *Archiv f. Geflügelkunde* 1956 /289-306.—In two experiments with growing chicks of 70 days each the growth-promoting effect of the following drugs and combinations of drugs has been tested:

1. 5 g Terramycin + 2,5 g Penicillin + 50 g 3-nitro 4-hydroxyphenylarsonic acid,
2. 1 g Terramycin + 2,2 g. Penicillin + 90 g arsanilic acid (Abbott),
3. 1 g Terramycin + 2,5 g Penicillin + 1500 g Vigofac (Pfizer),
4. 10 kg Micronin-supplement (Streit),
5. 10 kg Hydrolysat-supplement (Rossi),

per ton (= 1000 kg) of all mash.

Under the conditions of these experiments none of the mentioned drugs and combinations of drugs showed a definite growth response, nor did they improve feed efficiency. (Author's summary)

EVANS, ROBERT JOHN, SELMA L. BANDMER, and **DORIS H. BAUER.** (Michigan State U., East Lansing.)

METHIONINE AND CYSTINE REQUIREMENTS OF CHICKS DETERMINED BY CALCULATION. *Poultry Sci. 35(1):* 174-178. 1956.—Representative samples of common feedstuffs were assayed for "available methionine and cystine by in vitro digestion with the enzymes trypsin and erepsin and microbiological assay with *Leuconostoc mesenteroides.* Requirements of the growing chick for "available" methionine and cystine were calculated from experiments where a low methionine containing basal diet was supplemented with methionine. The "available" methtonine and cyscine contents of various diets were calculated by use of the values reported in this paper for "available" methionine and cystine contents of ingredients making up the diets. Depending upon the study used, the "available" methionine plus cystine requirement of growing chicks is between 0.22 and 0.46% of the diet with 0.15 to 0.42% as methionine.—R. J. Evans. *(Biological Abstracts)*

FISHER, HANS, JOHN DOWLING, Jr. (Rutgers U., New Brunswick, N. J.), and **KENNETH H. MADDY.** (Monsanto Chem. Co., St. Louis, Mo.)

LOW PROTEIN DIETS FOR TURKEYS RAISED UNDER PRACTICAL CONDITION. *Poultry Sci. 35(1):* 239-241. 1956.—The performance of lysine and MHA supplemented low protein turkey

diets was compared to standand turkey rations. Amino acid supplementation for the first 6 weeks resulted in growth up to 26 weeks of age, equivalent to that for higher protein diets. Supplementation beyond 6 weeks was of no added benefit at 26 weeks. No improvement was observed with amino acid supplementation of the 28% protein ration.—H. Fisher. *(Biological Abstracts)*

FISHER, HANS, and **C. B. HUDSON.** (Rutgers U., New Brunswick, N. J.)
CHICK VIABILITY AND PANTOTHENIC ACID DEFICIENCY IN THE BREEDING DIET, A CASE REPORT. *Poultry Sci. 35(2):* 487-488. 1956.—Cases of high chick mortality during the first week of life have been reported with increasing frequency recently. Symptoms of disorder included general listlessness and weakness suggesting a possible B vitamin deficiency. In a typical case chicks aflicted in the above manner were treated with B vitamins and in a series of trials, it was clearly established that a pantothenic acid deficiency was involved. Increasing the pantothenic acid content of the breeding ration alleviated the syndrome. Since the breeding diets involved in these cases always appear satisfactory with respect to pantothenic acid, it is suggested that the inclusion of fat into poultry rations may necessitate a higher level of pantothenic acid in view of its importance in fat metabolism.—Auth. summ. *(Biological Abstracts)*

GREGORY, B. R., O. H. M. WILDER, and **P. C. OTSBY.** (U. Chicago.)
STUDIES ON THE AMINO ACID AND VITAMIN COMPOSITION OF FEATHER MEAL. *Poultry Sci. 35(1):* 234-235. 1956.—Five samples of steam-proccessed feather meal were analyzed for 13 amino acid and 4 vitamins. Data are shown.—Auth. summ. *(Biological Abstracts)*

HAUSER, M. M., G. W. ANDERSON, W. F. PEPPER, and **S. J. SLINGER.** (Ontario Agric. Coll., Guelph, Canada.)
FURTHER EVIDENCE ON THE RELATION OF COLIFORMS TO THE GROWTH RESPONSE OF CHICKS TO ANTIBIOTICS. *Poultry Sci. 35(1):* 27-36. 1956.—A delayed growth response, accompanied by an increase in intestinal coliforms was obtained when chicks housed in a relatively clean environment were fed various levels of chloromycetin. Feed efficiency was progressively improved and lactobacilli counts reduced as the level of chloromycetin was increased from 10 to 200 ppm. In a 2nd trial, penicillin, Aureomycin, Terramycin, chloromycetin, 3 nitro-4-hydroxyphenylarsonic acid and sulfisoxazole were fed to chicks housed in a highly contaminated environment. With all of the drugs except sulfisobazole, increased growth rates, accompanied by increases in intestinal coliforms and reductions in enterococci, were obtained only during the initial stages of life. Both trials indicated that the growth response of chicks to antibiotics was related to an increase in intestinal coliforms.—M. M. Hauser. *(Biological Abstracts)*

HEUSER, G. F. (Cornell U., Ithaca, N. Y.)
FEEDING CHEMICALLY TREATED SEED GRAINS TO HENS. *Poultry Sci. 35(1):* 160-162. 1956.—Sweet corn seed was treated with Ceresan M, Semesan Jr. and Arasan. Of the 3 chemicals used, Arasan (an organic sulfur compound) caused a decided drop in egg production when the treated corn was fed to hens as 33-1/3% of the ration. Production dropped from 60-70% to about 10% in 2-3 days after feeding. Recovery after discontinuing the treated corn was also rapid. Two Hg compounds had no adverse effect. There was no effect from any of the samples upon body weight or mortality. All of the pens fed any type of corn gained in weight (3-12%). One sample of wheat treated with improved Ceresan (a Hg compound) and fed as one-half of the ration also caused a decline in egg production from 60-70% to about 25%. The drop was not as sudden as with the treated corn. There was no effect upon body weight or mortality. Neither pen fed wheat made weight gains (-0.2% and -1.6%). In the case of the treated corn which caused a drop in egg production,

all of the hens except 1 ceased production or produced intermittently. In the case of the treated wheat, 4 hens (1/3 of the pen) produced normally while the others ceased production or produced intermittently. There was no difference in the performance of hens receiving untreated field corn and untreated sweet corn.—G. F. Heuser. *(Biological Abstracts)*

HILL, F. W., D. L. ANDERSON, and **L. M. DANSKY.** (Cornell U., Ithaca, N. Y.)

STUDIES OF THE ENERGY REQUIREMENTS OF CHICKENS. 3. THE EFFECT OF DIETARY ENERGY LEVEL ON THE RATE AND GROSS EFFICIENCY OF EGG PRODUCTION. *Poultry Sci. 35(1):* 54-59. 1956.—Two experiments, each nearly a year long, were conducted with large groups of White Leghorn layers fed rations containing different concentrations of energy and composed of common feed ingredients. Energy concentrations ranged from 740 to 930 calories of productive energy per lb. (calculated) in one experiment, through changes in cereal components. In the other, energy concentrations from 945 to 1025 calories/lb. were used, achieved by supplementing a high energy ration with feed grade stablized tallow. Egg production rate was improved by increased energy level only during the winter. Gross efficiency of production, measured as feed required per dozen eggs, was markedly affected by energy level throughout the year. Relative to a ration containing 930 calories/lb., each 100 calories/lb. decrease in energy level increased feed requirement by 12%. Increasing energy level by the use of fat reduced feed requirement by 2% for each 1% added fat. Body weight was maintained at a somewhat higher level by rations high in energy concentration, and the total weight gained during the production year tended to increase with energy concentration.—F. W. Hill. *(Biological Abstracts)*

JENSEN, LEO S., J. S. CARVER, and **JAMES McGINNIS.** (State Coll. Washington, Pullman.)

EFFECTS OF VITAMIN E, N, N^1-DIPHENYL-PARA-PHENYLENE DIAMINE, AND FISH LIVER OIL ON REPRODUCTION IN TURKEYS. *Proc. Soc. Exptl. Biol. and Med. 91(3):* 386-388. 1956.—A deficiency of vitamin E was studied in Broad Breasted Bronze Turkey hens *(Meleagris gallopavo)*. Fish liver oil greatly accentuated the deficiency. A reduction in fertility due to a vitamin E deficiency was suggested. Both d-alpha-tocopheryl acetate and N, N^1-diphenyl para-phenylene diamine (DPPD) counteracted the deleterious effect of fish oil on hatchability. With fish oil in the diet tocopherol levels of the yolks of eggs were not appreciably increased by vitamin E or DPPD, even though hatchability was near maximum. DPPD alone did not appear to bring about maximum hatchability.—Authors. *(Biological Abstracts)*

KRATZER, F. H., P. N. DAVIES, and **B. J. MARSHALL.** (U. California, Davis.)

THE PROTEIN AND LYSINE REQUIR)MENTS OF TURKEYS AT VARIOUS AGES. *Poultry Sci. 35(1):* 197-202. 1956.—The need for protein decreased from approximately 20% of the diet at 8 weeks of age, and 15% at 16 weeks of age, to approximately 13.5% at 20 weeks of age. Lysine requirement decreased with age most rapidly in the first 4 weeks after hatching. After that period the decrease in lysine requirement was steady and approximately proportional to the decrease in protein level.—F. H. Kratzer. *(Biological Abstracts)*

LEWIS R. W. (Prairie View A and M Coll., Texas), and **P. E. SANFORD, A. T. ERICSON, D. L. HARRISON,** and **R. E. CLEGG.** (Kansas State Coll., Manhattan.)

FLAVOR AND AROMA OF BIRDS FED PURIFIED AND STANDARD DIETS. *Poultry Sci. 35(2):* 251-253. 1956.—A low-fat purified diet (Basal 1) and a standard diet (Basal 2) were fed to

chicks reared in wire-floored batteries for periods of 8 and 10 weeks. Organoleptic tests were conducted at 0 months storage and at the end of 6 months. Broth and pressure-extracted juice from the cooked meat of birds fed a standard diet consistently scored higher for intensity of flavor and aroma than those from birds fed a purified diet. Taste panel evaluation of light and dark meat from birds fed each diet showed that the flavor of birds fed the standard diet was preferred to that of birds fed the purified diet.—P. E. Sanford. *(Biological Abstracts)*

LEWIS, R. W. (Prairie View A and M Coll., Texas), and **P. E. SANFORD, A. T. ERICSON,** and **R. E. CLEGG.** (Kansas State Coll., Manhattan.)

EFFECT OF DIET ON THE ETHER-EXTRACT CONTENT OF CHICKEN MUSCLES. *Poultry Sci. 35(1):* 132-137. 1956.—In an study designed to study influence of certain feed ingredients on flavor of broilers, a number of diets not ordinarily encountered in investigations with chicks were used. These diets fed 0 to 8-10 weeks produced interesting effects on ether-extract content of muscles. An analysis of variance test revealed significant variations in ether-extract content of light meat muscles and highly significant variations in ether-extract content of dark meat muscles. Birds fed a low-fat purified-type diet deposited more ether-extractables in their light and dark muscles than those fed diets of higher fat content which contained natural ingredients. Distribution of external and muscular lipid was influenced by feeding a purified diet and modifying it with certain natural feed ingredients. —P. E. Sanford. *(Bioligical Abstracts)*

LILLIE, ROBERT J., J. R. SIZEMORE, and **C. A. DENTON.** (U. S. Dept. Agric., Beltsville, Md.)

FEATHER MEAL IN CHICK NUTRITION. *Poultry Sci. 35(2):* 316-318. 1956.—Studies were undertaken to evaluate the nutritional significance of feather meal in broiler diets. When New Hampshire broilers were fed an all-vegetable protein diet amply fortified with all known required nutrients, including an antibiotic, arsenical, methionine and folic acid, feather meal replaced fish meal on a weight basis in eliciting a growth response. The growth stimulation could not be attributed to protein content of feather meal. Evidence is present to show that feather meal contains an unidentified growth factor, possibly inorganic in nature, which chicks require for growth. —R. J. Lillie. *(Biological Abstracts)*

MENGE, H. R., R. J. LILLIE, J. R. SIZEMORE, and **C. A. DENTON.** (Agric. Res. Service, U. S. Dept. Agric., Beltsville, Md.)

AN UNIDENTIFIED MINERAL REQUIRED BY THE CHICK. *Poultry Sci. 35(1):* 244-245. 1956.—Chicks fed a practical type corn-soy bean meal ration considered adequate in all known required nutrients exhibited a significant growth response to both feather meal and feather meal ash. Feather meal that was ashed at 700° C for 5 or more hours was as effective in promoting growth of chicks as was the original material. It is therefore apparent that the unidentified growth factor present in feather meal is inorganic in nature.—Henry Menge. *(Biological Abstracts)*

MILLER, R. F., L. C. NORRIS, and **G. F. HEUSER.** (Cornell U., Ithaca, N. Y.)

THE VITAMIN B_{12} REQUIREMENT OF WHITE LEGHORN CHICKS. *Poultry Sci. 35(2):* 342-349. 1956.—Investigation of the vitamin B_{12} requirement of White Leghorn chicks during the first 6 weeks of life showed that the requirement is correlated with the amount of the vitamin supplied the hens, the quantity of vitamin B_{12} in the yolks of their eggs, and the amount present in the livers and unabsorbed yolk sacs of the newly hatched chicks. When the breeders were supplied enough vitamin B_{12} to promote approximately 63% hatchability of fertile eggs, chicks required not more than 0.25 μg of the vitamin per 100 g of high energy diet, or 0.53 μg/100 g of gain. When the quantity of vitamin B_{12} promoted approximately 83%

hatchability of fertile eggs, the amount required by the chick was not more than 0.125 μg/100 g of a medium energy diet, and not more than 0.16 μg/100 g of a high energy diet. These chicks required not more than 0.37 μg of vitamin B_{12}/100 g of gain. Hatchery chicks at times may require up to 0.125 μg of vitamin B_{12}/100 g of high diet, or 0.28 μg/100 g of gain to provide for their needs during their first 6 weeks. No evidence was obtained that 2.0 mg of pantothenic acid per 100 g of diet exerted a more sparing effect on the vitamin B_{12} requirement of chicks than 1 mg of pantothenic acid per 100 g of diet. —L. C. Norris. *(Biological Abstracts)*

MILNE, F. N. J.
THE VALUE OF MAIZE IN POULTRY FEEDING. *Queensland Agric. Jour. 79(2):* 113-118. Illus. 1954.—Mixtures containing 30-70% maizemeal were fed to chicks, growing pullets, 1st and 2d year layers in experiments at the Kairi Regional Experiment Station. Up to 40% maizemeal was satisfactory for the chicks, carried to 8 weeks, but the weight of the chicks fed 70% was only 81% of those fed the 30% mixture. The birds were taken on to 24 weeks and at the end of this period there were no significant differences in the weights of the 5 lots—fed 30% to 70% maizemeal. In the laying tests 3 levels of maizemeal— 55%, 62.5% and 70% were fed. Production was practically equal at the 3 levels for 1st year pullets, tested 2 years. For 2d year hens there was a drop in egglaying when fed the 70% mash. The tests show the error in the local prejudice against maize for summer feeding of poultry.—T. L. Bissell. *(Biological Abstracts)*

MOELLER, M. W., and **H. M. SCOTT.** (Illinois Agric. Expt. Sta., Urbana.)
EFFECT OF EQUALIZED FEED INTAKE ON THE RESPONSE OF CHICKS TO FISH MEAL. *Poultry Sci. 35(2):* 491-492. 1956.—Using the paired feeding technique and a purified diet it was found that fish meal improved chick growth 17.5% over ad libitum feeding whereas the response was reduced to 9.4% when feed intake was equalized within each pair. Thus fishmeal is capable of stimulating chick growth independently of its influence on feed intake. However with ad libitum feeding a portion of the response can be attributed to the favorable action of fish meal on feed intake.—Auth. summ. *(Biological Abstracts)*

MOFFATT, B. W.
SORGHUM FOR LAYERS. *Queensland Agric. Jour. 79(3):* 178-180. 1954.—To show the value of horghum grain as poultry feed, 200 birds were fed sorghum and 200 wheat on each of 4 farms in the Brisbane and Caboolture areas. Egg production over 26 weeks, culling rate and death rates were practically the same. At present sorghum is by far the cheaper grain and its use is recommended.—T. L. Bissell. *(Biological Abstracts)*

OLSSON, NILS, and **N. EDVIN OLOFSSON.** Försök Rörande Fiskprodukternas Tillvaratagande och Användbarhet Som Foder.
INVESTIGATIONS CONCERNING PRESERVED FISH PRODUCTS FOR ANIMAL FEED. *Lantbrukshökskolan Statens Husdjursförsök Meddel. 59:* 138. 1955.—The investigations were carried out for studying wet preservation of fish with formic acid and molasses. The wet preserved fish was tested in comparison with fish meal in feeding trials on chickens and growing pigs. The results obtained indicate that by the use of 1.5 l of formic acid or 20 kg molasses/100 kg final mixture a product with good keeping qualities was obtained There was no advantage in adding either 0.45 l formic acid or 2 l AIV-liquid to the molasses. In feeding fish meal to chicks slightly better growth was obtained than if a corresponding amount dry matter of wet preserved fish was used when AIV-liquid, formic acid or molasses were added as preservatives. The feeding of wet preserved fish was found to have no unfavorable influence on the health

of the chicks. When fed to growing pigs the fish meal produced 23-28 g better weight increase per animal per day compared to the corresponding amount of dry matter of wet preserved fish. When using a 25% corrected loss in slaughter weight the feed consumption per kg gain in weight was about .2 fe (sk) less in the lot that was fed fish meal than in the lot fed preserved fish. The feed consumption figures were 3.32 and 3.47 fe (sk), respectively. Iodine numbers for back fat of pigs fed fish meal and wet preserved fish indicated that these produced a slightly looser back fat than skim milk. The pork produced in feeding fish meal and wet preserved fish was fried and tested for odd flavor. This resulted in fishy flavor from 2 pigs fed fish meal and in one when wet preserved fish was fed. However, there was not complete agreement among those doing the testing. It was found that drying and preparing meal of fish is more advantageous than wet preservation if the products are to be used for chicks and pigs.—E. P. Johnson. *(Biological Abstracts)*

PARINA, SANTOS L. (Philippine-American Milling Co., Inc.)
A PRELIMINARY STUDY ON THE VARIATION OF CORN IN THE LAYING MASH UNDER PHILIPPINE CONDITIONS. *Philippine Jour. Animal Indust. 15(3/4):* 255-260. 1954.—A feeding trial was conducted with 3 lots of laying hens each with a different level of corn. It is recommended that the ration for laying hens in the Philippines contains 25-35% corn.—*W. A. Craft.* (Biological Abstracts)

PARKER, H. E., F. N. ANDREWS, C. W. CARRICK, R. D. CREEK and **S. M. HAUGE.** (Purdue U. Agric. Expt. Sta., Lafayette, Indiana.)
EFFECT OF MANGANESE ON BONE FORMATION STUDIED WITH RADIOACTIVE ISOTOPES. *Poultry Sci. 34(5):* 1154-1158. 1955.—Radioactive isotopes of Ca, P and Mn were used to determine the effects of the Mn in the diet on the location and amount of deposition of these elements in the bones of growing chickens. Bone sections from Mn deficient chicks accumulated more Mn^{52-54} than those from normal chicks. Radioautographs indicated that Mn^{52-54} was deposited in all parts of the tibiae with greatest concentrations being found at the sites of active calcification. The Mn level in the diet did not significantly affect the amount or location of deposition of Ca^{45} or p^{32} in the tibiae.—*H. E. Parker.* (Biological Abstracts)

PLONSKY, JACK. (Ray Ewing Co., Pasadena Calif.)
MODERN RESEARCH DEVELOPS EFFICIENT FRYER RATIONS. *Western Feed and Seed. 9(10):* 34, 36. 1954.—Texture, granulations, taste and aroma all are now found to influence daily feed consumption by poultry for fryers. Fats are becoming more important in diet but more research must be done on chemical quality. Fat soluble vitamins destroyed by fat oxidation are now preserved by antioxidants such as DPPD. Cottonseed meal low in free gossypol is now being produced and 5-15% can be included in fryer rations.—*J. F. Harrington.* (Biological Abstracts)

POPIEL, K., and **Z. SIKOROWICZ.** 1956. [Nat. Zootech Inst., Cracow.]
Wplyw zroznicowanego odczynu porkarmu na ksztaltowanie sie ilosciowego stosunku obu plci u kury domowej.
THE EFFECT OF DIFFERENTIAL FEEDING ON THE SEX RATIO OF THE DOMESTIC FOWL. *Pam. Inst. zootech. Polsce, 1955:* 61-73.—Light Sussex hens fed on an "acid" ration gave a sex ratio of 281.3 ♂♂ per 100 ♀♀ when mated with cocks fed on an "alkaline" ration, while hens fed on an "alkaline" ration gave 43.7% ♂ progeny when mated with "acid" cocks. The sex ratio of the controls was 105.7 ♂♂ per 100 ♀♀. Heavy breeds showed a greater response to treatment than did light breeds, such as White and Autosexing Leghorns. The practical possibilities of utilising these findings, and their theoretical bearing on the sex chromosome theory of sex determination are discussed.—Abstract of English summary. (Animal Breeding Abstracts)

PRICE, R. J., and **P. E. GINGHER.** (Res. Div., American Cyanamid Co., Pearl River, N. Y.)
EFFECT OF 2-ACETAMIDO-5-NITROTHIAZOLE ON EGG PRODUCTION, FERTILITY, HATCHABILITY, AND WEIGHT GAINS IN CHICKENS. *Poultry Sci. 35(2):* 327-333. 1956.—The compound, 2-acetamido-5-nitrothiazole (enheptin A), was given to normal, 12.5 week-old, single comb White Leghorn, Mt. Hope strain chickens during the growing period at the time most enterohepatitis outbreaks occur, using dosage schedules reported active against this disease in chickens. Effects on egg production, fertility, hatchability, and weight gains were studied. Enheptin A incorporated in mash at levels of 0.0075% and 0.15% was fed continuously for a 2-week period. Levels of 0.015% and 0.03% were fed on an intermittent schedule of 3 days medicated feed, 4 days nonmedicated feed, for a total of 12 days of medicated feed. Approximately 1000 hens were randomly distributed in 10 pens with 10 cockerels per pen. Each treatment level was fed to birds in each of 2 pens, and 2 pens were held as untreated controls. In both treated and untreated birds, egg production started at 20 weeks of age. Results were examined statistically. Observations and data indicate no significant differences between treated and untreated birds in egg production, fertility, hatchability, weight gains, and feed consumption.—*R. J. Price* (Biological Abstracts)

ROSENBERG, M. M., and **A. L. PALAFOX.** (U. Hawaii, Honolulu.)
RESPONSE OF GROWING AND MATURE PULLETS TO CONTINUOUS FEEDING OF CANE FINAL MOLASSES. *Poultry Sci. 35(2):* 292-303. 1956:—Pullets reared on graded levels of molasses up to 34.5% from day-old to 6 weeks of age were continued in this study without rerandomization on the same concentrations to 72 weeks of age in a series of 3 trials. Data were analyzed in 2 parts; i.e., from 6 to 24 weeks and from 24 to 72 weeks. Levels of molasses of 16.5% in trial 1 and 11.5% in trials 2 and 3 were able to support growth approximately as well as the control and at an average saving in the cost of feed per 24-week-old pullet of 5.9 and 9.0 cents, respectively. Although rate was retarded on the higher levels, only levels of molasses of 34.5% in trial 1 28.5% and 34.5% in trials 2 and 3 significantly depressed growth to 24 weeks of age. The cost of feed to raise these pullets was progressively less as the concentration of molasses was raised to 34.5%, and none of the concentrations exerted an adverse effect on either onset of maturity or rate of lay to 24 weeks of age. Levels of molasses as high as 28.5% with the exception of ration 16 (7.5%), did not adversely affect production, egg size, shell formation, meat and blood spots, livability, and, economy of converting feed into eggs from 24 to 72 weeks. In contrast, levels of molasses in excess of 7.5% significantly depressed gains in body weight, and concentrations exceeding 16.5% significantly increased the rate of egg soilage. Livability was not adversely affected by the highest level fed from hatching to 72 weeks of age.—*M. M. Rosenberg,* (Biological Abstracts)

SQUIBB, ROBERT L. (Instituto Agropecuario Nac., Guatemala City), **J. EDGAR BRAHAM,** and **NEVIN S. SCRIMSHAW.** (Inst. Nutrición de Centro América y Panamá Guatemala City.)
ABSORPTION OF VITAMIN A IN AQUEOUS AND OIL SOLUTIONS BY DEPLETED NEW HAMPSHIRE CHICKS. *Poultry Sci. 35(1):* 73-76. 1956.—The absorption rate of aqueous and oil solutions of vitamin A in New Hampshire chicks was studied. Subcutaneous injection of 1800 IU in oil, increased serum levels to 5μg/100ml after a 4 day period while 7500 IU injected subcutaneously or intramuscularly increased serum levels to 33 μg/100 ml and 29 μg/100 ml respectively after a 7 day period. When 7500 IU of vitamin A in aqueous solution was injected intramuscularly, maximum absorption was seen in a 24 hour period and an average level of 66 μg/100 ml obtained. When 7500 IU of an aqueous or oil soluble vitamin A were given orally, maximal serum levels of 50 μg/100 ml and 51 μg/100 ml, respectively, were seen within 24 hours.—*R. L. Squibb.* (Biological Abstracts)

SUNDE, M. L. (Wisconsin U., Madison.)
A RELATIONSHIP BETWEEN PROTEIN LEVEL AND ENERGY LEVEL IN CHICK RATIONS. *Poultry Sci. 35(2):* 350-354. —Four experiments were conducted with crossbred chicks (New Hampshire X Single Comb White Leghorn) to determine the importance of the energy, protein relationship. Twenty and 28% protein diets were used. Each of these diets was supplemented with 0, 5, or 10% white grease. Energy levels of 655, 730, 771, 806, 845, or 932 productive calories per lb. were used. Results showed that a high protein low energy diet caused a reduction in the growth rate and a reduced efficiency of feed utilization. Raising the energy level of this diet bythe addition of fat increased the weight of the chicks at both 4 weeks and 10 weeks and improved the feed utilization. Improvements in feed utilization were seen when the fat was added to the 20% protein diet. When the calories of productive energy per .01 lb. of crude protein were plotted against either weight or feed utilization figures, the results suggested that changing the protein level changed the optimal energy: protein ratio.—*M. L. Sunde.* (Biological Abstracts)

SUPPLEE, WILLIAM C., G. F. COMBS, and **G. LYNN ROMOSER.** (U. Maryland, College Park.)
FAILURE TO OBTAIN GROWTH RESPONSES WITH THIOCTIC ACID IN CHICKS FROM DIFFERENT SOURCES. *Arch. Biochem. and Biophys. 61(1):* 140-143. 1956.—DL-Thioctic acid was added to 2 different purified and one practical chick ration and fed to chicks of 3 different genetic sources and from dams fed different diets without effect as measured by growth and feed efficiency.—*G. F. Combs.* (Biological Abstracts)

SWART, L. G.
LUPINS IN LAYING RATIONS. *Farming in South Africa 30: 354:* 404-406 (1955).—In nutrition experiments at Stellenbosch University both sweet yellow lupins (Lupinus luteus) and bitter blue lupins (Lupinus Angustifolius) were fed in laying rations. The inclusion of 10 percent sweet lupin meal gave results which were not significantly lower than those obtained from ordinary laying rations containing fish meal. Higher levels of this protein feed had an adverse effect on the efficiency of feed consumption. The bitter or blue lupin was unsuitable as a feed because it imparted a bitter taste to the eggs.

WEST, JOHN W. (Mississippi Agric. Expt., Sta., State College.)
DEGOSSYPOLIZED COTTONSEED MEAL AS A SUBSTITUTE FOR SOYBEAN OIL MEAL IN A TURKEY GROWING MASH. *Poultry Sci. 35(2):* 304-307. 1956.—Groups of approximately 80 Broad Breasted Bronze turkeys were fed diets in which degossypolized cottonseed meal was used to replace 0, 20, 40, 60, 80 and 100% of the soybean oil meal in a practical-type turkey growing mash during the period from 8 to 28 weeks. Degossypolized cottonseed meal of high N solubility (80%) may be used to replace 100% of the soybean oil meal in a turkey growing mash without adverse effect upon growth, feed efficiency, uniformity and livability. Combinations of the 2 meals improved growth slightly over that obtained with either meal fed singly, thus indicating a complementary relationship.—*J. W. West.* (Biological Abstracts)

YACOWITZ, H., R. D. CARTER, J. WYNE, and **M. G. McCARTNEY.** (Ohio Agric. Expt. Sta., Wooster.)
EFFECTS OF VARYING PROTEIN AND FAT LEVELS IN A FINISHING RATION FOR TURKEY BROILERS. *Poultry Sci. 35(1):* 227-229. 1956.—Levels of 0, 3, and 6% stabilized animal fat were fed to growing turkeys in combination with calculated protein levels of 20, 23, and 26%. Analysis of variance of 16-week weights showed a significant difference among groups of males fed the various levels of fat. There were no significant differences among groups of males receiving various

protein levels. Neither protein levels nor fat levels alone significantly affected female weights at 16-weeks. Increasing levels of animal fat resulted in progressively better efficiency, while increasing protein levels had no effect on feed efficiency.—*R. D. Carter.* (Biological Abstracts)

PATHOLOGY

BOLIN, F. M. (North Dakota Agric. Expt. Sta., Fargo.)
FACTORS PRESISPOSING DOMESTIC FOWLS TO PASTEURELLOSIS. *Proc. North Dakota Acad. Sci. 4:* 16-19. 1950.—Discusses water and food deprivation, diet changes and cecal coccidiosis—*O. A. Stevens.* (Biological Abstracts)

BOOZE, RALPH.
NEW WEAPON AGAINST POULTRY DISEASES. *Western Feed and Seed 10(8):* 19-24, 34. 1955.—The use of mass vaccination against Newcastle disease and infectious bronchitis is discussed. Attenuated or modified live virus vaccine is added to drinking water, dusted or sprayed over chickens. The immunity does not last for the life of the chicken.—*J. F. Harrington.* (Biological Abstracts)

BROOKSBAND, N. H., and **P. K. C. AUSTWICK.** (Univ. Coll. South West, Exeter.)
SUSCEPTIBILITY OF INBRED AND OUTBRED CHICKS TO ASPERGILLOSIS. *Brit. Vet. Jour. 111(2):* 64-67. 1955.—A severe outbreak of aspergillosis in chicks which caused heavy mortality after 5 days of age was believed due to dust in the incubator room. The distribution of infection in few hatches suggested an increased susceptibility in inbred as compared to outbred and crossbred chicks.—*K. L. Bullis.* (Biological Abstracts)

BURMESTER, B. R. (Regional Poultry Res. Lab., East Lansing, Mich.), and **R. F. GENTRY.**
THE RESPONSE OF SUSCEPTIBLE CHICKENS TO GRADED DOSES OF THE VIRUS OF VISCERAL LYMPHOMATOSIS. *Poultry Sci. 35(1):* 17-26. 1956.—A study involving 1458 South Carolina White Leghorn chickens was made of the relation between the dose of the virus of visceral lymphomatosis (VL) and the response of the chickens over periods of 200 and 270 days when the material was given by the intraperitoneal route. Filtered plasma and lymphomatous liver filtrates from strain RPL 12 inoculated birds were the inoculums used in graded doses in 4 experiments. The primary response was the development of VL. Deaths occurred as early as 22 days after inoculation in a high dosage lot and continued in the low dosage lots for as long as the chickens were kept. Range in incidence was from a low 55.5% in a low dosage lot to a high of 90.1% in a high dosage lot, with an average age at death of 128.2 and 55.6 days in the same lots, respectively. In the intermediate dosage range, increases in dose caused step-wise increase in percentage of VL that occurred in 200 days but increases were small for each 10-fold increase in dose. A greater rate of change was noted in the average age at death which decreased rapidly with increases in dose. Based on the microscopic location of neoplatic cells, all cases of VL were classified into 1 of 2 types; namely intravascular or extravascular. The percentage of intravascular VL increased rapidly with an increase in dose but incidence of extravascular was inversely related to dose. A low but significant percentage of osteopetrosis also occurred in all inoculated lots. A consistent relation between dose and incidence of this bone disease was not obtained in 3 experiments, and an apparent inverse relation with dose was obtained in 1 experiment. Females were slightly more susceptible to VL, whereas males were slightly more susceptible to osteopetrosis.—*B. R. Burmeter.* (Biological Abstracts)

CARPENTER, CLIFF D.

TURKEY ORNITHOSIS. *Jour. Amer. Vet. Med. Assoc. 127(941):* 136. 1955.—Dr. K. F. Meyer suggests that the infection of any birds exclusive of psittacine species caused by members of the pneumonitis-psittacosis-lymphogranuloma group be designated as ornithosis. Use of the term turkey ornithosis emphasizes the difference in epidemiology between it and the 1929-30 pandemic of psittacosis.—*J. F. Ruff.* (Biological Abstracts)

DJAENOEDIN, R., and **R. P. UTOJO.** 1956

SARCOMATOSIS IN TURKEYS (SARCOMATOSIS PADA KALKUN) *Hemera Zoa LXIII (7-8):* 343-344.—Since the existence of Coligranuloma in poultry and ducks has been known (Hemera Zoa LXI, No. 5-6, 1954), this veterinary snapshot will be a continuation to the foregoing one. It is a case of a tumor occurring in a turkey and seems to be Coligranuloma. This tumor is of different corn grain size, white rather greyish, of soft consistency, spread throughout the whole liver, lungs and adherent to the pleura costalis. Also this time the macroscopic alterations of the process were like tuberculosis, however acid-fast bacilli could not be found, on the other hand rather big bipolar bacilli were present in the tumors of the liver and the lungs. Cultivation on a medium shows almost pure-culture of bacillus Escherichia. Further investigation however, shows some different characters other than Escherichia coli, among other things:

Lactose and salicine test: negative; inosit fermentation test: positive, while the gas formation, which must be very high for coli bacilli, is not present at all. After all according to Kauffmann, it belongs to the species of Paracolobactrum. Histological investigation of the tumors shows round cells, almost no protoplasm, appearing in the form of chains which structure is not characteristic, thus like a sarcoma. The discovery of the bacillus, genus Escherichia, is only a secondary importance. (Author's Summary)

EBBELL, H., (Ovomaltine Farm, Oberwangen b. Bern, Switzerland.)

ON THE PROBLEM OF THE PROPHYLACTIC SUPPLEMENTING OF COMMERCIAL FEEDS WITH COCCIDIOSTATICA. (Zur Frage der prophylaktischen Beimschung von Coccidiostatica zum Gelflügelmischfutter) *Schweitzer Archiv. f. Tierheilkunde,* 1956/4.—The possibilities of control of fowl coccidiosis are critically discussed and the following statements made:

Hygienic keeping alone does not solve the problem, as the chicken which are grown up without contact with the parasites do not acquire any premunity.

Control of coccidiosis in infected herds by treatment only involves a certain danger by deaths and other damages. The best method is the administration of coccidiostatica with the fodder during at least 12 weeks. Supposed normal raising conditions and a certain minimal coccidia content of the litter a sufficient premunity can develop which protects the animals after cessation of the addition of coccidiostatica. As the majority of fowl breeders are not able to prepare a homogeneous mixture of small quantities of coccidiostatica with the fodder the author proposes that such mixtures should be allowed for the market. Suggestions regarding regulation, tests, declaration and directions for use are made.

In connection with outbreaks of coccidiosis in fowl the author is of the opinion, that veterinarians should be consulted to a greater extent than up to now. (Author)

EVELETH, D. F. (North Dakota Agric. Expt. Sta., Fargo.)

THE TOXICITY OF NITRATES FOR BABY CHICKS. *Proc. North Dakota Acad. Sci. 3:* 41-43. 1950.—Water containing 4000 ppm of nitrate is nontoxic to day-old chicks but .073 M Na Cl or Na No_3 tends to produce kidney damage and edema.—*P. A. Stevens.* (Biological Abstracts)

EVELETH, D. F. (North Dakota Agric. Expt. Sta., Fargo.)
INFECTIONS SINUSTIS OF TURKEYS. *Proc. North Dakota Acad. Sci. 4:* 20-22. 1950.—A virus or Rickettsia is suggested. (Biological Abstracts)

FAHEY, J. E., and **J. F. CRAWLEY.** (Connaught Med. Labs., Toronto, Canada.)
STUDIES ON CHRONIC RESPIRATORY DISEASE OF CHICKENS VII. THE NATURE OF INFECTION WITH THE PLEURO-PNEUMONIA-LIKE ORGANISMS. *Canadian Jour. Comp. Med. and Vet. Sci. 20(1):* 7-19. 1956.— The causative agent of chronic respiratory disease (CRD) has been described at various times as a virus, an organism resembling *Hemophilus gallinarum*, a "coccobacilliform body" and a pleuropneumonia-like organism (PPLO). Nelson has described 3 types of avian coryza involving *H. gallinarum* or "coccobacilliform bodies" or both, and it has been concluded that the "coccobacilliform bodies" and PPLO are identical. Evidence is presented in the present paper to show that PPLO produce a syndrome indistinguishable from Coryza II infection of Nelson. Infection of chick embryos with broth cultures of PPLO resulted in increased embryo mortality and pipped eggs. In addition mortality was greater in the first 72 hours in chicks hatched from infected eggs. Broiler chick infection with PPLO resulted in a mild coryza with ocular and nasal discharges, conjunctivitis and head shaking. In older birds PPLO caused no symptoms. It is suggested that PPLO infection alone be referred to as Coryza II (Nelson) or pleuropneumonia coryza, distince from CRD which results in more severe respiratory symptoms. Air-sac infection may accompany CRD but is not a necessary characteristic lesion.—*A. Greig.* (Biological Abstracts)

MATHEY, WILLIAM J. JR. (Coll. Agric., U. Georgia, Athens), and **DONALD V. ZANDER.** (U. California, Davis.)
SPIROCHETES AND CECAL NODULES IN POULTRY. *Jour. Amer. Vet. Med. Assoc. 126(939):* 475-477. 1955.—0.2-10 cm. nodules with a cheesy core found in the ceca of turkeys, chickens, and pheasants disclosed spirochetes in the underlying fluid. Such triturated ceca fed to week-old chicks resulted in spirochete containing cecal nodules at 1 month. No nodules developed with intravenous exposure. Affected chicken ceca fed to a turkey also resulted in reproduction. Fluid from a nodule allowed to grow in chicken embryos and 5 subsequent passages. The spirochete was believed to be *Spironema ceci-gallorum*, Harris 1930. —*J. F. Ryff.* (Biological Abstracts)

SADEK, S. E., L. E. HANSON, and **J. O. ALBERTS.** (U. Illinois, Urbana.)
SUSPECTED DRUG-INDUCED ANEMIAS IN THE CHICKEN. *Jour. Amer. Vet. Med. Assoc. 127(942):* 201-203. 1955.—An anemia syndrome was increasingly encountered in chickens during the past 3 yrs., characterized by listlessness, loss of flesh, paleness of comb and wattles, weakness, and death; and is associated with extensive use of drugs. The morbibity has been 5-40% but the mortality has been low. In birds of 3 affected flocks, blood changes similar to those of human hypoplastic anemia were encountered; in a fourth, anemia and agranulocytosis were seen. Drugs were previously used as flock treatments and appeared to be the cause.—*J. F. Ryff.* (Biological Abstracts)

SNOEYENBOS, G. H. (U. Massachusetts, Amherst.)
IS COCCIDIOSIS GAINING RESISTANCE TO DRUGS? *World's Poultry Sci. Jour. 11(3):* 223-224. 1955.—While at least one sulfonamide resistant strain has been found, most work has indicated no loss in susceptibility to present coccidiostats. Medication the first 10-12 weeks usually allows development of immunity.—*J. B. Christiansen.* (Biological Abstracts)

QUINN, JOSEPH P., A. W. BRANT (U. S. Dept. Agric., Beltsville, Md.), and **CLARENCE H. THOMPSON, JR.** (U. S. Dept. Agric., Washington, D. C.)

EFFECT OF A NATURALLY OCCURRING OUTBREAK OF NEWCASTLE DISEASE (ND) ON EGG QUALITY AND PRODUCTION. *Poultry Sci. 35(1):* 3-10. Illus. 1956.—Observations were made on 3817 eggs from 2 groups of pullets of similar heredity, 1 group having recovered from the disease. When held 14 days at 100°F the percentage thick white decreased 5 times as much in eggs from the ND recovered group as in the controls. Eggs from the pullets recovered from the disease weighed significantly less than eggs from the controls, but had better shell quality as indicated by egg weight losses. Egg production in the ND infected group dropped to zero for a short period and gradually returned to a normal level. Mortality in the ND recovered flock was much higher than in the control flock.—*J. P. Quinn.* (Biological Abstracts)

POULTRY PRODUCTS AND MARKETING

BAKER, R. C., H. B. NAYLOR, M. C. PFUND, E. EINSET, and **W. STAEMPLI.** (Cornell U., Ithaca, N. Y.)

KEEPING QUALITY OF READY-TO-COOK AND DRESSED POULTRY. *Poultry Sci. 35(2):* 398-406. 1956.—The determination of the relative keeping quality of dressed as compared to ready-to-cook poultry was the object of this work. Greater use was made of the bacterial and rancidity tests in an attempt to find the cause of the off flavor. Broiler carcasses for this experiment were placed under 3 holding conditions: crushed ice, 35°F, and 45°F. Thirteen dressed and 13 ready-to-cook carcasses were held under each storage condition. Bacterial counts in the ready-to-cook poultry were higher and increased more rapidly than in the dressed poultry. Counts were higher for the poultry stored at 45°F; intermediate for those stored at 35°F; lowest for those in ice. Bacterial counts within the different storage conditions did not seem to materially influence personal opinion flavor rating of the cooked broilers. The ready-to-cook birds, which had the highest bacterial counts, were preferred in flavor to the dressed birds. The dressed carcasses showed more hydrolytic rancidity of fatty tissue than did ready-to-cook carcasses.—*From auth. abst.* (Biological Abstracts)

FROMM, DANIEL, and **P. H. MARGOLF.** (Pennsylvania State U., University Park.)

THE EFFECT OF DIETHYLSTILBESTROL ON DRESSING AND COOKING LOSSES OF NEW HAMPSHIRE BROILER-FRYERS. *Poultry Sci. 35(2):* 254-256. 1956.—Ten 8-week-old New Hampshire cockerels were subjected to one 12 mg diethylstilbestrol pellet planted subcutaneously in the neck at base of the skull and were housed with a similar number of untreated birds. At 13 weeks of age all cockerels were killed, dressed, and eviscerated. Dressing percentages were calculated. Half-carcasses were weighed and broiled 30 minutes. The cooked half-carcasses and drippings were weighed for loss due to evaporation. The group of treated birds had a significantly greater dressing percentage than the untreated group. Total shrinkage in cooking was slightly but significantly higher for the treated group. The difference between groups in broiler pan liquid retained was not significant.—*P. H. Margolf.* (Biological Abstracts)

KUTACEK, M., M. VALENTA and **M. RUML.** 1956. Agrilcultural University, Prague, Czechoslovakia. (Elektroforesa na papíre ve sluzbáhch zemedelské biochmie III. Kvantitativní vyhodnocení bilkivinnych frakcí v seru drubeze.)

ELECTROPHORESIS ON FILTER PAPER IN AGRICULTURAL BIOCHEMISTRY III. QUANTITATIVE EVALUATION OF

PROTEIN FRACTIONS IN THE SERUM OF POULTRY. *Sborník CAZV, XXIX, zivocisná vyroba, 1:* 7-13.—The serum proteins of poultry were analysed by means of the electrophoresis on filter paper. The average values of levels of the serum proteins were established for cocks, hens, ducks, geese and turkeys and were compared with the results obtained by the application of Tiselius free electrophoresis. Vacillation of separate protein fractions of individual birds was also observed during a definite period. As a conclusion some interdependencies were found and discussed. (Orel)

ORR, H. L., E. C. HUNT, and **E. S. SNYDER.** (Ontario Agric. Coll., Guelph, Canada.)

A COMPARISON OF DRESSING PERCENTAGES AND YIELD OF EDIBLE COOKED MEAT IN FIVE STRAINS OF TURKEYS AS BROILERS AND AS MATURE STOCK. *Poultry Sci. 35(2):* 333-338. 1956.—Dressing percentages and meat yields of 5 strains of turkey were compared, both at broiler age and as mature stock. The effect of strain was found to be significant in both, when calculated on the basis of percentage yield of dressed, ready-to-cook and edible cooked meat in relation to the live weight. Also the yield of edible cooked meat in the adults of each strain exceeded that of the corresponding broilers.—*H. L. Orr.* (Biological Abstracts)

SIMON, E. 1956. (Universitas Indonesia, Bogor)

THE EGG-SHELL OF THE HEN. *Hemera Zoa, LXIII (7-8):* 334-339.—The egg-shell of the bird is described, and it is pointed out that its essential parts (shell-membrane, chalk-shell and cuticle) have completely various characteristics. The report deals in particular with the kind of layers in the shell and their connections and transmitting canal system. The very numerous singularities of shell structures reported are limited to the most essential points, in order that the veterinarian will be able to survey quickly and sufficiently the new findings. This knowledge will enable him to judge problems in regard to the quality or conservation of eggs. (Author)

SPENCER, J. V. (State Coll. Washington, Pullman), **W. J. STADELMAN, E. A. SAUTER,** and **J. G. DARROCH.**

MEASURED ALBUMEN QUALITY AS AFFECTED BY TIME AFTER BREAKOUT. *Poultry Sci. 35(2):* 319-322. 1956.—Albumen quality as determined by Haugh units, was measured on eggs from different hens at time intervals of 1/6, 1, 2, 3, 4, 5, 7 and 10 minutes after being broken out. Albumen quality declined linearly with the logarithm of elapsed time from break-out and the rate of loss was influenced by the hen as well as the age of the egg.—*J. V. Spencer.* (Biological Abstracts)

ZNOJILOVA, V., and **V. ZOUFALY.** 1956. (Control Agricultural Institut, Brno, Czechslovakia). O romenlivosti vnitrni jakosti vajec behem snaskoveho obdobi.) The seasonal variation in interior

THE SEASONAL VARIATION IN INTERIOR EGG QUALITY. *Polnohosodarstvo, 1956, III:* 325-37.—The egg quality of three economically important breeds, White and Brown Leghorns and Rhode-Island Reds were examined. The analysis of 5,443 eggs from 837 hens in three laying periods in 1951-54 shows that the inner quality of eggs is influenced by year and seasons. A decline of thethick white quality during the laying season was evident. The albumen was most watery in June. The Brown Leghorns proved the best albumen quality. The colour of yolks varied in the year periods. In January, February and March the yolk became very pale. First in April it has a rich orange colour. The yolk colour of Brown Leghorn eggs was more intensive than of the other ones. It has been ascertained the best quality of the autumn and winter eggs. (Orel)

MANAGEMENT

ERASMUS, J. E.

ARTIFICIAL LIGHTING OF LAYING HENS. *Farming in South Africa 30: 355:* 445-446 (1955).—The average production of two groups of hens consisting of 114 birds per group was 189.9 eggs in the lighted houses and 178.1 eggs in the unlighted pens in 365 days. The difference per hen was not significant at P = 0.05. Although the total egg production body weight, feed consumption and mortality are not affected to any extent by artificial lighting this system can be recommended during the winter period.

GOWE, R. S. (Canada Dept. Agric., Ottawa.)

ENVIRONMENT AND POULTRY BREEDING PROBLEMS. 2. A COMPARISON OF THE EGG PRODUCTION OF 7 S.C. WHITE LEGHORN STRAINS HOUSED IN LAYING BATTERIES AND FLOOR PENS. *Poultry Sci. 35(2):* 430-435. 1956.—Seven strains of S.C. White Leghorn pullets were hatched and reared together and at 160 days of age, a random sample of 35 birds of each strain were randomized to a 3 deck individual cage laying battery while 42 birds of each strain were randomly assigned at 3 per strain to 14 floor-pens. There was a highly significant interaction between strains and locations (floor-pen and battery) with respect to survivor egg production and March body weight. There was no evidence of any interaction between strains and locations for the following traits, hen-housed egg production, sexual maturity, March egg weight and laying house mortality. It would appear that some strains of S.C. White Leghorns can adapt themselves to battery cages better than other strains. Tests to determine the relative genetic worth of egg production strains for cage operations should be conducted in batteries.—*R. S. Gowe.* (Biological Abstracts)

HUTCHINSON, J. C. D. 1956. (Agric. Res. Coun. Poult. Res. Centre, Edinburgh.)

CONTROL OF SEASONAL VARIATION IN THE EGG PRODUCTION OF HENS. *Nature [Lond.], 177:* 795-976.—One of 2 groups, each of 21 Brown Leghorns from an inbred line, was reared from the age of 8 wks. under conditions of artificial lighting in which day length was 23½ hrs.; in the 2nd group day length was 12 hrs. About 2 mths. after the birds had come into lay the day length of the 1st group was gradually reduced to 12 hrs. over a period of 8 wks. and then maintained at this level. By this "devernalisation" procedure the seasonal reduction in day length in late summer and early autumn was simulated in an exaggerated way. For the 2nd group the day length was maintained at 12 hrs. throughout the experiment. "Devernalisation" resulted in a considerable drop in egg production accompanied by moulting. A similar experimental devernalisation after the birds had been in lay for about a year also resulted in heavy moulting and an almost complete cessation of egg production, although the controls maintained a reasonable rate of lay. It is thought that if late summer and autumn "dever nalisation" is prevented and the birds are kept on an intensive system, hatching in Britain could be carried out at any time of year. (Animal Breeding Abstracts)

KALTOFEN, R. S. (Inst. Animal Husbandry T. N. O., Beekbergen, Holland.)

HATCHING EXPERIMENTS AT BEEKBERGEN—TURNING THE EGGS. *World's Poultry Sci. Jour. 11(3):* 204-209. 1955.—A broody hen rises and cools eggs slightly when turning them. Thermocouple recordings indicated egg turning every 0.5-1 hour during days and every 1-2 hours at night. In a 5,000 and a 60,000 egg comparison with incubator groups equalized by hens, hourly turning in incubators gave 6% higher, and 8 times a day turning a 3% higher hatchability than obtained with the usual 3 times a day turning. The second week was of chief importance.—*J. B. Christiansen.* (Biological Abstracts)

MARAIS, C. L.

HOW TO START WITH GUINEA FOWL. *Farming in South Africa 32: 4:* 37-40 (1956).—The management of guinea fowl is described under the following sub-headings. Roosting and hatching places, general appearance of male and female, breeding birds, hatching and rearing of young stock.

McCARTNEY, MORLEY G. (Pennsylvania State U., University Park.)

THE EFFECT OF DAY-LENGTH ON RATE OF GROWTH, FEED CONVERSION, FEATHERING AND MARKET QUALITY OF TURKEYS. *Poultry Sci. 35(2):* 468-475. 1956.—In 2 experiments, 1 group of 150 White Holland and 150 Beltsville Small White turkey poults each were hatched on June 21, 1954 and January 7, 1955, respectively. All poults were reared under natural environmental conditions of light and temperature to September 21, 1954 and April 1, 1955, respectively. On these dates each group was divided into 2 comparable groups and the 1st group in each experiment continued under natural environmental conditions, while the 2d group was continued under natural environmental temperature but with day-length maintained at 13 hours. In the 1st experiment, growth and feed conversion were the best for the turkeys receiving the 13-hour day, while in the 2d experiment it was the best for the turkeys receiving natural day (day-length increased from 12 to 15 hours). Results indicate that turkeys require at least a 13-hour day and possibly a 15-hour day for maximum growth and utilization of feed.—*M. G. McCartney.* (Biological Abstracts)

NEAL, WAYNE M.

CANNIBALISM, PICK-OUTS AND METHONINE. *Poultry Sci. 35(1):* 10-13. 1956.—Cannibalism in growing Rhode Island Red pullets was stopped by adding 1 oz. commercial DL-methionine/100 lb. of diet. Pick-outs in layers was controlled by addition of 0.10% metthionine (3 oz./575 birds/day) to a diet containing 0.20% methionine and 0.25% cystine (calculated).—*W. M. Neal.* (Biological Abstracts)

PODHRADSKY, J., and **J. VANEK.** 1956 Agricultural University, Brno, Czechoslovakia (Vliv osvětlování kurntků na nosnost a biologickou hodnotu vajac.)

THE EFFECT OF HENHOUSE LIGHTING ON LAYING AND ON BIOLOGICAL QUALITY OF EGGS. *Sbornik CSAZV, XXIX, zivocisna vyroba, 8:* 545-62.—Experiments with lighting of henhouses. After a week the egg production in the lighted group began to increase and the increase continued up to the 4 weeks and afterwards decreased so that at the end of the laying period the egg production was equal to the group of unlighted hens. During the control period from January 10th to the end of September the egg output was higher in the lighted group by 8.9 and 15.5%.

Lighting of henhouses reduced the fertilization and hatchability of winter eggs. In the lighted group there were 17.8% of clear eggs and in the unlighted group 12.6%. In March, April and May the difference was only 1.42% and without importance.

The author recommends the lighting of the henhouse also for the breeding hens, because there is an important increase of egg output and the decrease of hatchability is of no importance. He recommends to study the vitality of chickens from eggs produced in lighted henhouses and in henhouses without lighting. (Orel)

STEVENS, R. W. El pollo para asar y la ciencia

SCIENCE AND THE RAISING OF "BROILERS". *Veterinaria [Uruguay] 4(4):* 13-20. 1955.—A discussion of the scientific methods developed during the past few years that have enabled the raising of young chickens to become a major industry in the field of food for mankind. Mention is made of how the best breeds of chickens have been selected, how the type of bird has been improved through breeding, methods of mass hatching of eggs and the raising of the chickens,

methods of developing and selecting properly balanced diets for the growing birds, methods of proper sanitation and disease control, and methods of properly preparing the dressed carcass for the market.—*A. C. Walton.* (Biological Abstracts)

WILSON, W. O. (U. California, Davis)
IDENTIFYING NON-LAYING CHICKEN HENS. *Poultry Sci. 35(1)* 226-227. 1956.—Laying pullets were forced out of production by either injecting progesterone or withholding water. The concentration of carotenoid pigment of the blood serum was determined for the succeeding fortnight. Resorption of maturing yolk follicles resulted in increased carotenoid pigment in the serum that reached a peak on the 6th day. Ovulating non-laying hens have very large amounts of carotenoids in the serum.—*W. O. Wilson.* (Biological Abstracts)

GENERAL

BALEZIN, P. S. 1956. Pticevodstvo v Kitae.
POULTRY BREEDING IN CHINA. *Pticevodstvo, 6(4):* 38-42.—In China in the era before the Chinese People's Republic it is estimated that there were 250,000,000 poultry, of which 47,000,000 were ducks and 7,000,000 geese; numbers have by now exceeded their pre-war level. There are 7 breeds of fowls, 3 of ducks and 2 of geese, all of which are widely distributed; each of these is briefly described and their av. production noted. In addition there are many indigenous breeds, especially of fowls, in each province. (Animal Breeding Abstracts)

DE BEER, J. A.
CENTRAL EGG LAYING TEST. *Farming in South Africa 32: 2:* 43-45 (1956).—The production results are given of the 28th consecutive open test the 20th Breeders Register Test conducted in single pens and the First Progeny and Open Trapnest tests 1954-55. The average egg production per hen in 48 weeks was as follows:

Type of test.	*Number of egg, per hen.*	*Percentage Mortality.*
Open Single Pen	212.3	18.1
Breeders Register Single Pen	216.5	14.3
Open Trapnest	204.4	17.0
Progeny Trapnest	186.8	14.5

The progeny test was restricted to 10 daughters per pen bred from the same sire and not less than 5 dams with a maximum of 3 daughters for any particular dam. The mortality in all tests was 16 percent. The highest producer, a White Leghorn hen laid 295 eggs in 336 days and the highest pen of 10 White Leghorn hens laid 236.1 per hen.

HARRY, E. G., R. F. GORDON, and **J. F. TUCKER.** (Poultry Res. Sta., Animal Health Trust, Houghton.)
THE DESTRUCTION OF DAY-OLD CHICKS. *Brit. Vet. Jour. 111(4):* 150-162. 1955.—Tests made with N, CO, CO_2, exhaust gases from a petrol engine, coal gas, butane, CCl_4 and chloroform indicated that the exhaust gases were most efficient for large operations and chloroform for small ones. Abrupt asphyxiation with no narcotic depression seemed to induce apprehension and was therefore considered undesirable. The chamber containing exhaust gases should be left closed for 3 minutes after being filled. Using a container 17" x 17" x 30", 60 ml of chloroform vaporized in the upper part was considered most desirable, leaving the container closed 10 minutes.—*K. L. Bullis.* (Biological Abstracts)

ERASMUS, J. E.
THE BELTSVILLE TURKEY. *Farming in South Africa 32: 4:* 57-60 (1956).—The general breed characteristics of the Beltsville White turkey is described.

HILL, J. F., and **A. W. NORDSKOG.** (Iowa State Coll., Ames.)
EFFICIENCY OF PERFORMANCE TESTING IN POULTRY. *Poultry Sci. 25(2):* 256-265. 1956.—Two sets of data were analyzed to estimate the effects of variety, location, and interactions of these for rate of egg production (R) and adult mortality (M) in chickens *(Gallus domesticus).* The 1st set of data contained 55 inbred-hybrid tested at 13 widely separated locations for 1 year. Statistically significant differences between varieties and between locations were obtained for both R and M. From the 2d set of data, taken from 10 varieties tested at 4 locations for 3 consecutive years, year effects were statistically significant for M but not for R. On the other hand, locations x years and years x varieties were statistically significant for R. In the case of M, varieties x years and varieties x locations were statistically significant. Replicating tests over years was more efficient for comparing varieties than replicating over locations for both R and M.—*J. F. Hill.* (Biological Abstracts)

MENZI, M. (Schweizerische Geflügelzuchtschule, Zollikofen)
A STUDY OF THE ACCURACY OF SAMPLING METHODS FOR THE ESTIMATION OF MEAN EGG WEIGHT. (Statistische Untersuchungen über die Genauigkeit einzelner Erhebungsmethoden bei der Bestimmung des mittleren Eigewichtes einer Henne) *Archiv f. Geflkünde* 1956 249-270.—The present investigation is based on the records of egg weight of 50 SCWL hens during 350 days with a total of 9821 eggs. It was found that:

(1) the environmental part of the variance (s_u^2 = DQ within hens) can be essentially reduced by a monthly stratification of the annual records;

(2) with the exception of the first two months the correlation and the regression of the monthly and annual mean weights are very high.

The accuracy of several sampling methods was estimated by

$$s_{\bar{x}}^2 = \frac{v-N}{v} \cdot \frac{s_x^2}{N}$$

and the following suggestion can be made:

a) The accuracy of the annual mean egg weight is much higher when it is taken from monthly stratificated samples than from a random sample of the same total size spread over the whole year.

b) Monthly stratificated records, made only during a part of the year, give a good base for the selection for egg weight. At the beginning of the laying year short sampling periods are biased by the individually varying increase in egg weight.

c) For the period from December to September one monthly samples give already a useful base for the selection.

The accuracy of the studied sampling methods is shown for several sizes and production levels in corresponding graphicals.—Author's summary)

SADEK, S. E. (Dept. of Vet. Pathol. and Hyg., Coll. Vet. Med., U. Illinois, Urbana.)
A SIMPLE DIRECT TECHNIQUE FOR COUNTING AVIAN BLOOD CELLS. *Jour. Amer. Vet. Med. Assoc. 127(940):* 72-73. 1955. —Giemsa stain, 10 ml, 5 ml neutral formalin, , and 85 ml 0.85% saline is used as diluting fluid, and the diluted cells are stored overnight in the refrigerator.—*J. F. Ryff.* (Biological Abstracts)

VAN ROOYEN, JAN.
FINE OSTRICH FEATHERS FROM FINE BIRDS. *Farmers Weekly, March 14:* 16-17 (1956).—When the feather trade was at its

peak in 1913, 1,023,307 lb. of ostrich feathers valued at £3,000,000 were exported from South Africa. For the past 30 to 36 years very little information was published on the South African ostrich (Struthio Australis Gurney). In this article the author describes various aspects of ostrich farming such as production records, differences between types of ostriches, feather structure and plucking, management and marketable products.

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January 1, 1956 to December 31, 1956

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Receipts		
Memberships	3,208.50	1354- 1- 2
Advertising	3,138.89	
Subscriptions	389.90	1- 6-10
Congress reports and back volumes	147.12	113-13- 6
Transfer from Major Macdougall	2,527.59	
TOTAL	$13,510.19	£2541- 6- 4
Expenditures		
Printing Journal (5 issues)	$ 4,093.52	
Clerical and Administrative	909.05	£ 120- 0- 0
Postage	565.07	23-16- 0
Supplies (letterheads, envelopes, forms, stencils, etc.)	290.82	14-11- 4
Abstracts	55.00	5- 5- 0
Translations		3- 0- 0
Editor	392.00	
Associate Editor	220.00	
Congress Reports		148-13- 7
Taxes	18.20	
Travel Expenses		146- 5- 2
Rebate to Branches		148-10- 0
Subscriptions and Reprints	12.05	
Sundry Expenses		4-19-11
Transfer to Savings	6,000.00	
Transfer to Treasurer		949-19- 0
TOTAL	$12,555.71	£1565- 0- 0
Balance December 31, 1956	$ 954.48	£ 976- 6- 4
Savings Account		
Balance December 31, 1955	$14,925.24	
Deposits	6,000.00	
Interest	254.75	
Balance December 31, 1956	$21,179.99	
Credit—Suspense Account		£ 2- 0- 0
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N. F. Waters, Box 270, East Lansing, Mich.
L. A. Watt, Poultry Tribune, Mount Morris, Ill.
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W. C. Wharton, 706 E. Gage Ave., Memphis Tenn.
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H. F. Williamson, 261 Riverside Drive, Salisbury, Md.
F. H. Wiltshire, McKeesport R.D. 1, Pa.
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J. L. Wolf, R.D. 5, Bloomsburg, Pa.
H. Yacowitz, Squibb Inst, for Med. Res., New Brunswick, N.J.

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Vojko Marinkovic, Institut za Stocarsto, Zemum-Polje

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NOTICES TO MEMBERS

Ballot for Amendments to Constitution:

Attention is called to the ballot which is included as an insert in this issue of the Journal.

Appointment to Council:

Please note that President Coles has appointed Mr. F. Cumber to the vacancy on the Council for England created by the death of Mr. W. Marshall.

Subscriptions for 1957:

Please remit to the Treasurer-Assistant Secretary, Dr. Gustave F. Heuser, Rice Hall, Cornell University, Ithaca, N. Y., U.S.A. or to the Secretary-Assistant Treasurer, Major Ian Macdougall, Agricultual House, Kinghtsbridge, London, S.W. 1, England, or in certain countries to the persons indicated.

Individual Membership—$3.00 or One Pound.

Members of the United Kingdom Branch of the World's Poultry Science Association should forward 5 shillings additional to Major Macdougall.

Parent Stock Hatching Eggs and Baby Chicks For Breeding Purposes From Leading U. S. Breeders

For the best available parent-stock baby chicks and hatching eggs from any breed or breeding farm in the United States, write directly to us for information and prices. We are specialists in this type of business and represent most breeders of the United States.

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Affiliated Membership—$15.00 or Five Pounds

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Denmark: Niels Vonsbaek, Fjerkreexportudvalget, Axelborg, Copenhagen
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New Zeland: F. C. Bobby, Department of Agriculture, P. O. Box 2298, Wellington, C. I.
Norway: Leif Svendsen, Norsk Fjoreavislag, Tollbugt 12, Oslo.
Spain: Senor Luis Latorre, Facultad de Veterinaria, Corboda.

Subscriptions of members in Australia, Germany, Japan, the Netherlands, South African, Sweden and Switzerland should be paid to their Branch Secretaries as shown on page 106.

Sharper Grit Grinding Edges Release More Nutrients From Grains and Grasses

HELPS LAYERS PRODUCE MORE EGGS WITH LESS FEED

GRAN-I-GRIT is the most attractive Grit on the market. The special built modern cutting equipment we use in producing GRAN-I-GRIT, produces edges that are always extra sharp.

Sharper grinding edges grind feed better and finer. Finer grinding of feed and grasses releases additional nutrients which permits birds to get more body building nourishment from their feed . . . this helps improve livability of chicks, growing stock and layers.

GRAN-I-GRIT is insoluble. It will not dissolve and cannot change the mineral balance in the feed used.

SPEEDS GROWTH AND FEED CONVERSION OF BROILERS

GRAN-I-GRIT HAS EYE APPEAL FOR HENS

Tests by leading poultry authorities have proven that layers prefer a grey grit with black specks . . . . THE GRAN-I-GRIT TYPE . . . . as much as 10,15 and even 100 to one over grit of other colors.

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THE GRIT WITH THE SHARPEST GRINDING EDGES EVER CUT

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With Blackhead causing losses costing about 15¢ a poult, on a national average, a true, economical Blackhead *preventive* seemed a practical necessity to DR. SALSBURY'S Poultry Scientists.

Through long, intensive work, DR. SALSBURY'S Histostat was developed, tested, and proved a *highly effective* Blackhead preventive *under the most exacting, controlled conditions!*

Now thousands of turkey growers have successfully raised millions of birds on feed containing Histostat. Their *practical field experience* more than *bears out the scientific test results.** In fact, turkey growers find Histostat is *not only highly effective, safe and palatable,* but *truly economical* as well . . . that 2 birds saved more than pay for preventive medication for 100 birds . . . that expensive "treatments" *after* preventable outbreaks are now not only "old fashioned," but economically impractical, by comparison.

This is a gratifying reward for the DR. SALSBURY'S Poultry Scientists devoted to seeking new ways and means to put *dynamic meaning* in DR. SALSBURY'S LABORATORIES' pledge of: "Nation-wide service to the poultry industry."

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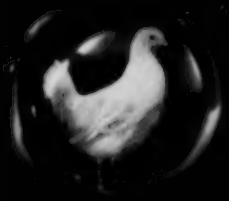
provides complete coccidiosis protection



allows development of solid immunity

In recent years, much discussion has arisen over the question of whether any preventive coccidiostat fully meets the anti-coccidial needs of the replacement flock owner. To do so, the drug should (a) permit development of immunity in suitably protected replacements, and (b) be sufficiently flexible to meet the need for protection in the face of varying levels of coccidiosis exposure.

A long series of Merck trials in the laboratory and in the field now confirm that one drug—NiCarb—meets these requirements. These trials can be summarized as follows:

1. NiCarb permits exposed replacements to establish immunity to coccidiosis. This immunity is equal in every respect to that occurring in unprotected birds which have survived an attack of coccidiosis.
2. This immunity has developed in every case on exposure to cecal coccidiosis (*E.tenella*) and intestinal coccidiosis (*E.necatrix*, *E.acervulina* and *E.maxima*).
3. NiCarb markedly suppresses oocyst production but does not eliminate oocysts completely. As a result, other birds and subsequent broods may be exposed to the coccidia in the litter and thus are permitted to develop their own immunity.
4. NiCarb is highly flexible, allowing effective immunity to develop over a wide range of exposure.

Because NiCarb is intended only for preventive use, and because precise formulation is mandatory, it is marketed exclusively in the feeds of reputable feed manufacturers. Your knowledge of this product, however, will permit you to be of distinct professional service to your poultry clients.

For complete details on the immunity trials discussed above, send today for the Merck Service Bulletin, using the coupon below.

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MERCK & CO., Inc.
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Please send your new Service Bulletin on immunity trials with NiCarb.

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U.S.I. FEED NEWS

★ A SERIES FOR SCIENTISTS AND EXECUTIVES OF THE FEED MANUFACTURING INDUSTRY ★

Effectiveness of Energy-Protein Ratio Depends on Proper Amino Acid Balance

It is felt by some authorities that the important biological factor of protein quality is oftentimes overshadowed or overlooked due to the significance attached to the mathematical value of a protein-energy ratio. For highest feed efficiency at lowest feed cost, protein quality must be looked upon as being just as important as the amount of protein in the diet.

Proper amino acid balance — the most accurate indication of protein quality — is essential, otherwise the animal cannot make efficient use of the energy and other nutrients in the ration. In fact, a deficiency of an essential amino acid can cause failure of the entire diet.

Methionine is one of the essential sulfur amino acids necessary for proper amino acid balance and is the one most likely to be deficient in poultry starting rations. Experiments and field results have proved beyond doubt that supplemental methionine will increase feed efficiency and improve feathering and market finish of birds.

Price reductions during the past year make it more practical than ever to include methionine in formulations. In addition, U.S.I. has a wall chart, handy formula, and work sheets that make it simple and easy to estimate methionine requirements of a poultry ration in relation to the energy level. Copies free on request. Write Editor.

DL-METHIONINE FOR HIGH ENERGY RATIONS

U.S.I. is the pioneer producer of methionine, the low-cost, essential amino acid. Rations that are supplemented with DL-Methionine produce increased return over feed costs and a more rapid growth rate. Methionine is also effective in improving feathering. Your best supply — from U.S.I.

U.S.I. Feed News A Regular Feature

Each month U.S.I. publishes a full page FEED NEWS in the leading publications reaching nutritional and feed formulation specialists. Informative items of interest to all who use feeds and feed supplements are included. Follow this series in U.S. feed publications for new developments in the poultry feeding industry, or send us your name, address and title on your company letterhead to be placed on our mailing list.

FORMULATION SERVICE OFFERED BY U.S.I.

Of particular interest to foreign feed manufacturers is U.S.I.'s formulation service. Special mixes of vitamins, antibiotics and methionine designed to meet your specifications are available. In addition, U.S.I. will be glad to review your formulas in the light of new concepts in nutrition.

FEED PRODUCTS OF U.S.I.

- VACATONE 40* (molasses distillers dried solubles)
- U.S.I. VITAMIN B_{12} AND ANTIBIOTIC FEED SUPPLEMENTS
- U.S.I. CHOLINE CHLORIDE (25% dry or 70% solution)
- U.S.I. MENADIONE MIXES (vitamin K_3)
- U.S.I. RIBOFLAVIN Products
- U.S.I. NIACIN
- U.S.I. CALCIUM PANTOTHENATE Products
- U.S.I. DL-METHIONINE (feed grade)
- U.S.I. VITAMIN A & D Products (stabilized)
- USIMIX* Vitamin Premixes (vitamins and antibiotics to meet your specifications)

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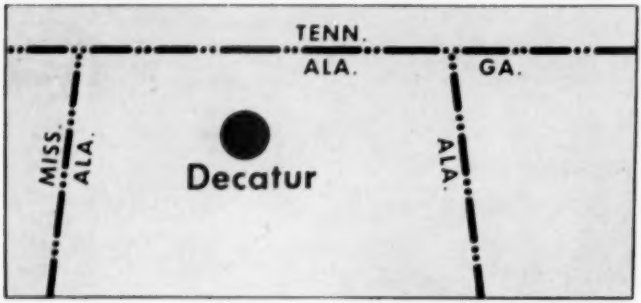
Division of National Distillers Products Corporation
99 Park Avenue, New York 16, N. Y.

Ful-O-Pep studies all phases of the

BROILER BUSINESS

in Northern Alabama



Here's where extensive research is being done . . . right in the heart of one of the biggest broiler producing areas in the country!

BREEDING AND HATCHING. Breeder supply flocks, consisting of 25,000 hens, supply the up-to-date Ful-O-Pep Hatchery at Athens, Alabama, with high quality eggs. In fact, eggs from these hens last year averaged 82 chicks sold per 100 eggs set. Weekly capacity of the hatchery is 58,000 chicks.

PROCESSING AND MARKETING. 25,000 birds are processed daily at the modern Ful-O-Pep plant at Decatur, Alabama. Birds that have been tested on different rations are carefully checked for carcass quality and color. The dressed birds are marketed through two wholesale outlets located at Nashville and Memphis, Tenn.

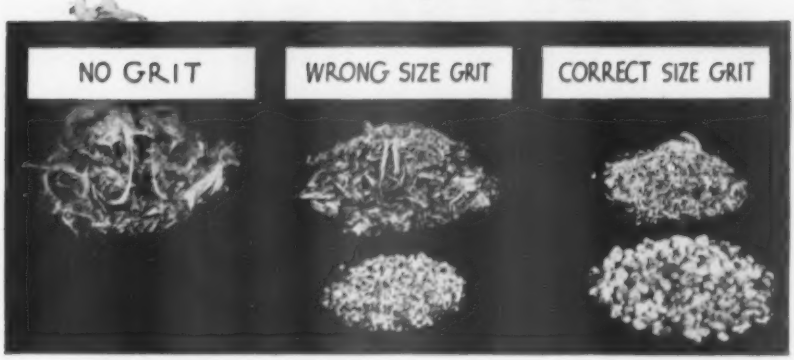
GROWING AND FEEDING. 40,000 birds are continuously under close surveillance at Ful-O-Pep research houses where practical housing and management methods are being used. New ingredients . . . new formulas . . . and new coccidiostats and other medications are tested to determine the most efficient and economical way to grow broilers. In addition, 400,000 broilers are continuously on feed.

PARTNERS IN PROGRESS. This continuous research in Alabama, is to help the breeder, grower and operator, make more money. Not only has it enabled Ful-O-Pep to produce better breeder and broiler feeds, but also has helped solve some hatchery, processing and marketing problems. Yes, nutritional leadership and proved performance is the story of Ful-O-Pep . . . a story of profit to poultrymen.

THE QUAKER OATS COMPANY

. . . makers of dependable feeds for over 70 years

Do litter, feathers and fiber rob your broilers of gizzard space for processing feed?



This picture tells you why Stonemo Granite Grit is needed

Look at this picture carefully. At the end of 9 weeks and 3 days broilers fed an all-mash diet were killed and the contents of the gizzards washed and later dried.

Note the fiber, feather, litter content of the gizzard from a single bird (see section of picture marked "no grit".) Note how much less cloggy bulk there is even when grit of the wrong size is used (see section of picture marked "wrong size grit".) Now look at the section of the picture marked "correct size grit." See how fine the granite grit grinds the feathers, litter, and fiber. This gives birds more room in their gizzards for processing feed for extra body weight.

That's another reason why broilers receiving Stonemo Granite Grit show better feed conversion and you have less cost in producing a pound of gain.

These scientific studies conducted on Stonemo's Research Farm point the way to bigger broiler profits.

Give your broilers Stonemo for good healthy gizzards. Stonemo grinds up feathers, fiber, and litter—saves feed and reduces growing costs. We recommend broilers receive fine size Stonemo for the first three weeks, medium size through six weeks, finishing with coarse size Stonemo.

No product in poultry management costs so little and does so much to make money for you as Stonemo Granite Grit.

STONE MOUNTAIN GRIT COMPANY, INC.
Lithonia, Georgia

STONEMO

the grit with the

EXTRA GRINDING SURFACES

Aurofac®

AUREOMYCIN® Chlortetracycline and Vitamin B_{12} Mixture

STILL A LEADER IN THE FIELD OF POULTRY NUTRITION

AUROFAC the first and most widely used antibiotic feed supplement, has now been shown to exert even greater activity when fed continuously at levels of 50 to 200 grams per ton of feed.

The incidence of such debilitating diseases as CRD, blue comb, sinusitis and nonspecific enteritis is markedly reduced in flocks which receive continuous high levels of AUREOMYCIN Chlortetracycline in the ration. It has also been observed that high levels of AUREOMYCIN increase the rate of growth and feed efficiency, and reduce the number of death losses and culls when fed uninterruptedly from hatching until marketing. In layer flocks, egg production, hatchability and livability of chicks are often considerably improved.

Extensive field trials, involving over 2,000,000 birds, have proved that continuous high level feeding of AUREOMYCIN is highly effective and economically practical under actual poultry-raising conditions.

For further information on AUROFAC Feed Supplement and the new program of High Level Feeding of AUREOMYCIN, write to AMERICAN CYANAMID COMPANY, FARM AND HOME DIVISION, NEW YORK 20, N. Y.

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A quarter of a century ago Whitmoyer Laboratories was founded to meet the then existing need for a more scientific approach to problems of poultry health and nutrition. Now—in this our 25th Anniversary Year—our continued aim is to provide the poultry and feed industry with products of proven efficacy, palatability and economy.

Important recent developments include products in the antibiotic field and in the field of coccidiosis control.

KEMITRACIN is a chemically pure antibiotic complex which provides the feed industry with an antibiotic of the highest uniformity and purity. It is used in the feed at the same gram level as any other quality antibiotic for disease control, improving egg production or for growth promotion.

AQUATRACIN is a similar antibiotic designed for use in the drinking water of poultry and swine. It dissolves rapidly and uniformly. AQUATRACIN is so completely soluble that it can be used in mechanical waterers without any difficulty. There is no sediment to clog the waterers.

WHITSYN products utilize synergism to gain maximum effectiveness in coccidiosis control with a minimum drug dosage. There is a product for each phase of coccidiosis control. WHITSYN-S is used in the drinking water for treating outbreaks. WHITSYN-5 is used in the feed for treating outbreaks. WHITSYN-10 is used in the feed for preventing coccidiosis. Each product is effective against both the cecal and intestinal types.

Your request for additional data on these—or on other Whitmoyer products—will be most welcome. You are cordially invited, too, to consult with our staff members on poultry health or nutritional matters.

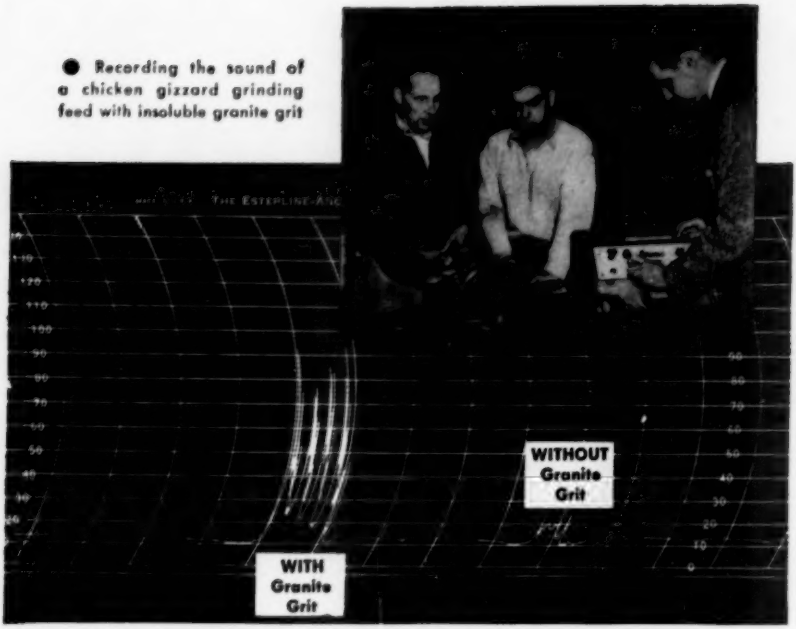
Whitmoyer LABORATORIES INC

Manufacturing Chemists

MYERSTOWN, PENNA., U. S. A.

IN CANADA: Whitmoyer Laboratories, Ltd., Yarmouth, Nova Scotia

● Recording the sound of a chicken gizzard grinding feed with insoluble granite grit



Oscillograph by National Broadcasting Company, Inc.

EXTRA GRINDING EFFICIENCY NOW PICTURED AND RECORDED

This picture-graph, prepared by the National Broadcasting Company, shows you why birds fed insoluble granite grit break down their feed particles finer for more complete digestion and assimilation—why granite grit helps to provide extra feed efficiency.

The Granite Grit Institute will also be glad to let you hear this extra grinding efficiency. For the first time, the sound of a chicken's gizzard action with and without insoluble granite grit has been recorded by a sensitive microphone and a powerful amplifier.

FREE RECORDING

This vinylite 78 RPM record is yours, free, for playing before groups interested in poultry, poultry research, or the teaching of poultry husbandry. For your copy, simply write the Granite Grit Institute at the address below and tell us how and where you plan to use this educational record.

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